CERAMIC ABSTRACTS and THE BULLETIN

OF THE

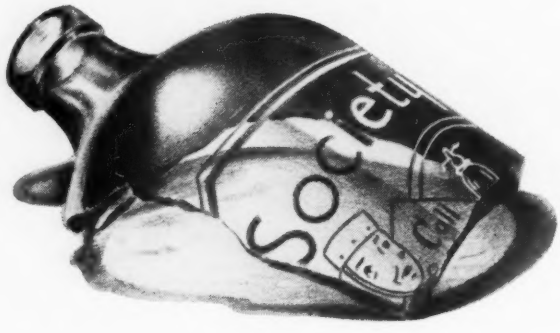
# AMERICAN CERAMIC SOCIETY

MARCH 15, 1944

MONTHLY PUBLICATION DEVOTED TO THE ARTS AND SCIENCES RELATED TO THE SILICATE INDUSTRIES

## FORTY-SIXTH ANNUAL MEETING PROGRAM

## WAR CONFERENCE



# Piece of bottle with a history...

• One day this piece of bottle arrived with a request to match the cream color of the glass label applied on it. Our technologists took the order in stride because their case history files are full of unusual items they have matched. Now this piece of bottle is part of the collection and another name is on our customer list.

Tailor-making colors for manufacturers of all kinds of glass and ceramic products is one of the most interesting and constructive things we do. From this rich experience we have developed new techniques that have helped to solve many wartime problems—and promise new and even better colors when restrictions are lifted.

We welcome the opportunity to cooperate with you on production problems involving the application of colors and coloring chemicals. Just drop us a factual letter on your company letterhead and our service is at your disposal.

DEPENDABLE SERVICE ON

Oxide Colors
•
Body, Slip and Glaze Stains
Overglaze and Underglaze Colors
•
Glass Colors
•
Squeegee Oils and Mediums
•
Gold, Silver, Platinum and Lustre Preparations
•
Metallic Oxides and Chemicals
•
Porcelain Balls and Linings
•
Flint Pebbles . . . Mill Linings
•
Rotospray Sifters
•
Decorating Supplies

YOUR PARTNER IN SOLVING COLOR PROBLEMS

**Drakenfeld**

B. F. DRAKENFELD & CO., INC.
45–47 Park Place, New York 7, N. Y.
*Factory and Laboratories:* Washington, Pa.

*Pacific Coast Agents:*
Braun Corp., Los Angeles 21 . . . Braun-Knecht-Heimann Co., San Francisco 19

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*Publication Office:* 20th & Northampton Sts., Easton, Pa.
*Editorial, Executive, and Advertising Offices:* 2525 N. High St., Columbus 2, Ohio.
*Committee on Publications:* J. D. SULLIVAN, *Chairman:* H. H. BLAU, R. L. STONE, J. J. CANFIELD, HARRY THIEMECKE, R. C. PURDY.

Entered as second-class matter at the post office at Easton, Pa., under the act of March 3, 1879. Published monthly.
Subscription $1.50 a year. Single copies twenty-five cents.
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# Lancaster

THE SCIENTIFIC COUNTER-CURRENT RAPID BATCH MIXING SYSTEM

## "Lancaster" Provides the Right COMBINATION . . .

## Counter-Current Mixing plus Balanced Mulling

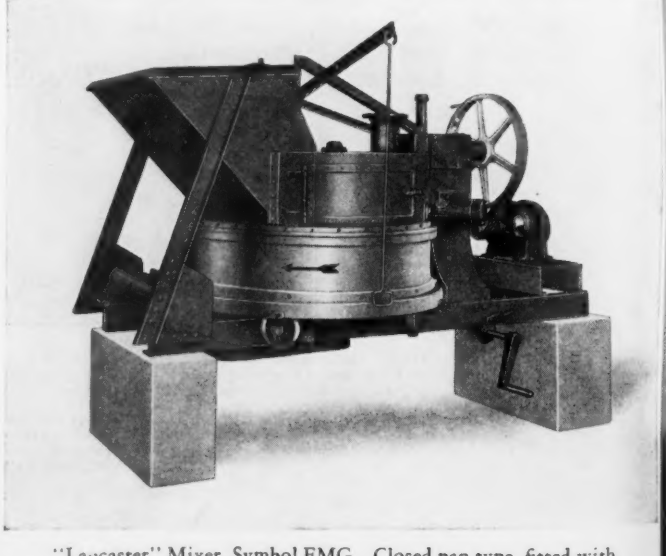
MODERN batch mixing derives from a combination of two factors . . . counter-current mixing plus balanced mulling . . . the proved combination as incorporated only in "Lancaster" Mixers.

In the "Lancaster," clockwise rotation of the mixing pan combines with counter-clockwise rotation of the mixing plows and mullers to provide (1) dependable uniformity . . . batch after batch . . . and (2) precision blending to highest formula properties with possible savings of expensive ingredients.

"Lancaster" Mixers charge fast . . . mix fast . . . discharge fast . . . provide exceptionally high hourly unit productivity . . . better results from other processing operations . . . fewer rejects . . . improved man-hour efficiency.

Recommendations applicable to your mixing problems will be submitted without obligation promptly upon request. Write today.

Illustration shows how material is conveyed by clockwise rotation of mixing pan and deflected by stationary side wall plow into the path of counter-clockwise rotating plows and muller (or mullers) which are established off-center of pan diameter.



"Lancaster" Mixer, Symbol EMG. Closed pan type, fitted with full batch stationary hopper.

# MIXERS

## 4 "LANCASTER" ADVANTAGES

1. **WIDE ADAPTABILITY.** Through the principle of balanced mixing-mulling action, "Lancaster" Mixers are successfully applicable to development of formulas over a range of Dry, Damp, Stiff-kneadable, Soft-kneadable or Slurry consistencies.

2. **SCIENTIFIC CONTROL.** In the "Lancaster," . . . with each complete revolution of the mixing pan . . . the entire batch receives *uniform* and *intensive* mixing-mulling treatment.

3. **DEPENDABLE PERFORMANCE.** The "Lancaster" Mixing System will reproduce the same qualities in finished mix batch after batch, with exceptional dependability. Particles are uniformly distributed regardless of variations in size, weight or physical characteristics. Liquid additions are dispersed with marked efficiency.

4. **OPERATING ECONOMY.** Machine tool construction, cut tooth gears, steel castings and ball or roller bearings provide substantial economies in power and maintenance. These economies have been proved in diversified industries.

**"Lancaster" Mixers are being successfully used for more than 30 diversified mixing processes including precision formulas for products such as: Abrasives, Bituminous Compounds, Catalysts, Ceramics, Chemicals, Concrete and Cement Mortars, Foundry Sands, Glass (including Opticals), Mycalex Products, Powdered Metals, Refractories (including Refractory Mortars), Steatite, Vitreous Enamels, Welding Electrode Coatings and many others.**

**LANCASTER IRON WORKS, INC.**

BRICK MACHINERY DIVISION

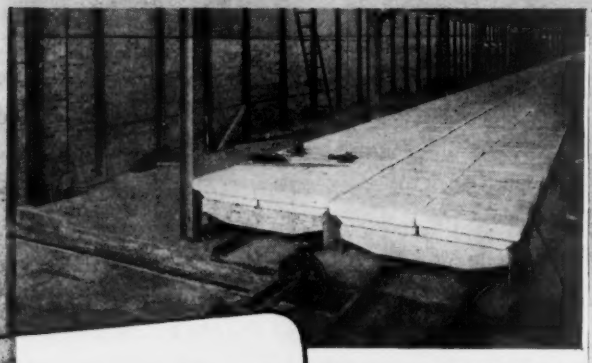
**LANCASTER, PENNA., U. S. A.**

**1919** Mt. Clemens Pottery Co., Mt. Clemens, Mich. Still firing dinnerware after 25 years of operation.

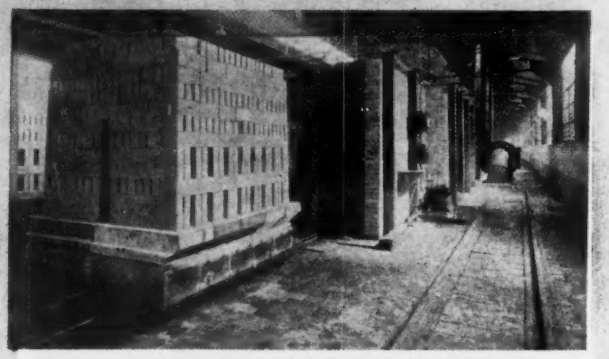
**1923** [illegible] Still firing electrical porcelain after 23 years continuous operation.

**1923** Ohio Clay Co., Cleveland, Ohio. Common brick and hollow building tile. Still in operation after 21 years.

**1924** A. E. Hull Pottery Co., Crooksville, Ohio. Still firing kitchenware and artware after 20 years continuous operation.



**1924** Homer Laughlin China Co., Newell, W. Va. Firing semi-porcelain dinnerware for 20 years.



**1925** General Refractories Co., Salina, Pa. Producing fire brick after 19 years continuous service.

**HARROP KILNS ARE SUCCESSFULLY FIRING** Dinnerware, Electrical Porcelain, Sanitary Ware, Common and Face Brick, Art Pottery, Floor and Wall Tile, Abrasives, Porcelain, Hotel China, Semi-Porcelain, Textile Porcelain.

*RECENT HARROP INSTALLATIONS* — Stupakoff Ceramic & Mfg. Co., Mansfield Sanitary Pottery, Westinghouse Elec. & Mfg. Co., Globe Union, Inc., Wellsville China Co., RCA Victor Corp., Niles Fire Brick Co., Basic Magnesium, Inc., National Bureau of Standards, Armstrong Cork Co., Robison Clay Products Co., R. Thomas & Sons Co., Bendix Aviation Corp., (Marshall Eclipse Div.), Medalta Potteries, Ltd., Zapun Ceramics (decorating).

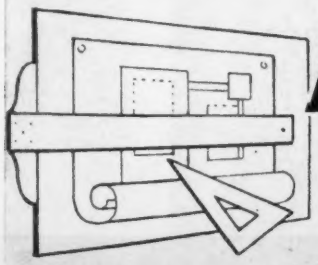
# Wed OBSERVE THE 25TH ANNIVERSARY OF HARROP CERAMIC ENGINEERING SERVICE

Fifty years ago Dr. Edward Orton and his associates established ceramic technology at Ohio State University. Today we join in paying tribute to these men whose work and vision have so greatly contributed to the advancement and economic well-being of their fellow men.

In this time of war we are especially grateful to these men . . . for their pioneering efforts are responsible for the importance of ceramic products in aiding our war effort . . . the refractories to meet important industrial requirements, steatite for insulation in high frequency radios and other electrical devices, our high quality optical glass and a thousand other products.

Today we also celebrate the 25th anniversary of our own organization. It is significant that the Harrop Ceramic Service Company was also established here in Columbus, the home of Ohio State University . . . the birthplace of ceramic technology. For fourteen years our founder, Carl B. Harrop, was a member of Dr. Orton's staff. He saw that it was necessary to have equipment of the highest efficiency in order to insure the results of the university's technological work. In 1918 he started what is today the Harrop Ceramic Service Company and designed and developed the Harrop Tunnel Kiln. So fundamentally sound was this original design that today tunnel kilns have changed little with the exception of improvements in refractories, burners and other mechanical equipment.

In the twenty-five years that the Harrop organization has served the ceramic industry it has built more than 300 tunnel kilns . . . and been retained by hundreds of leading ceramic plants on special engineering problems. From its offices here in Columbus, Harrop engineers have gone throughout the nation and into many foreign countries, engineering and building ceramic plants and equipment that stand today as living memorials to the two outstanding pioneers of ceramic technology.



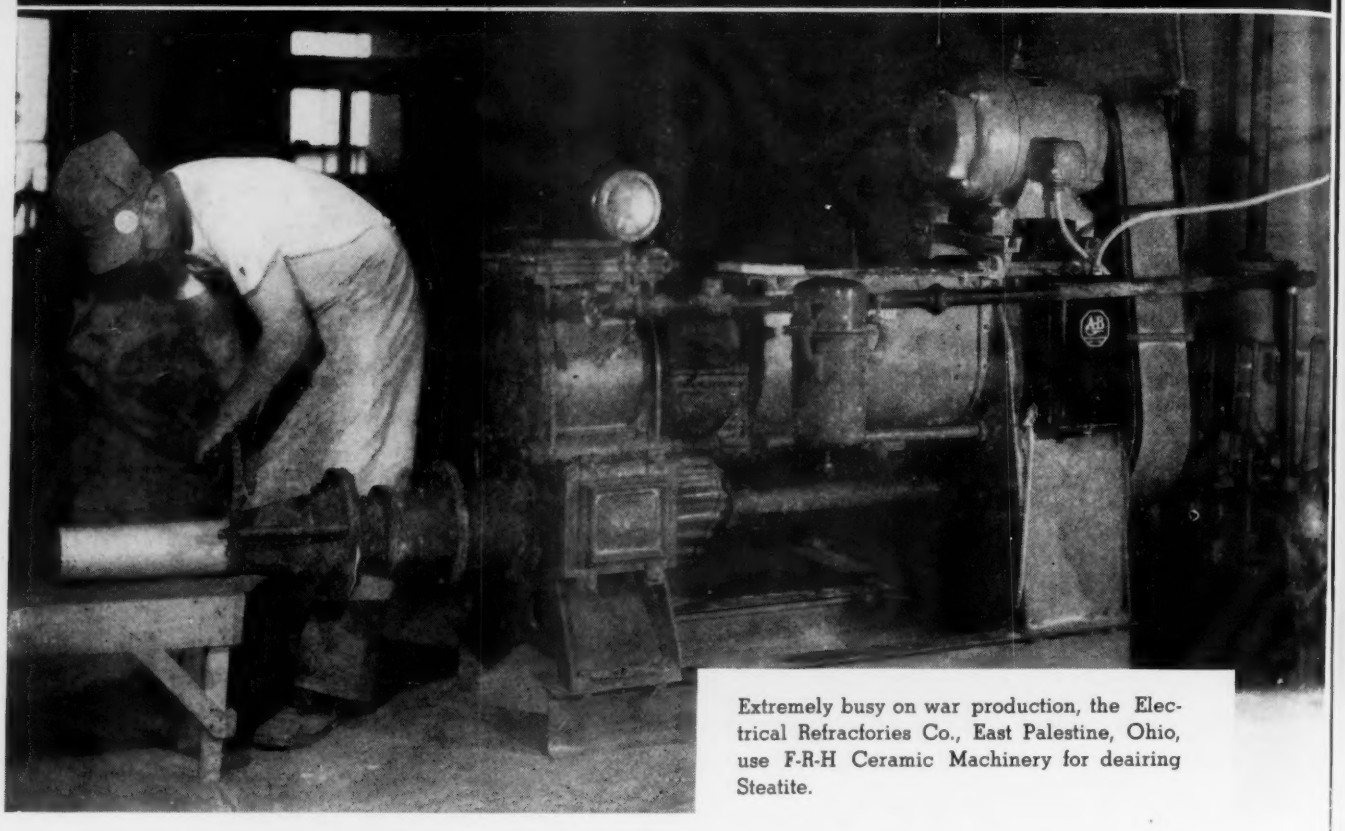
**HARROP CERAMIC SERVICE COMPANY**

35 E. GAY ST. COLUMBUS, OHIO

## SEND FOR THESE NEW BULLETINS

For those interested in car tunnel kilns and driers, now or in the future, we have prepared these two important bulletins covering both large and small production. Here is the complete story on tunnel kiln operation. They're yours for the asking . . . no obligation.

# OWNER SATISFACTION . . .



Extremely busy on war production, the Electrical Refractories Co., East Palestine, Ohio, use F-R-H Ceramic Machinery for deairing Steatite.

## AND REPEAT ORDERS PROVE IT!

Would you buy another? When the answer is "yes" it's the best evidence of merit in any piece of equipment. Production economies provided by efficient and durable F-R-H DeAiring Machines result in many repeat orders for this ceramic machinery.

Typical of the recommendations from owners of F-R-H machines is the one from The Electrical Refractories Co. ". . . we like it—we bought the second machine." Owner satisfaction, backed by a repeat order, is the proof of high quality.

On all ceramic assignments, F-R-H has consistently given satisfaction to owners. Investigate these machines that increase production, lower operating costs and bring higher net income returns. Models and sizes for all clay working needs.

**THE FATE-ROOT-HEATH CO.**

**Plymouth, Ohio, U. S. A.**

**BUY MORE U. S. WAR BONDS!**

**PLYMOUTH Industrial Locomotives**

**F·R·H**

**Clay Working Machinery**

**SILVER KING Industrial Tractors**

*Fine Ceramic*

# CLAYS

UNITED CLAY MINES

CORPORATION

TRENTON ⁘ NEW JERSEY

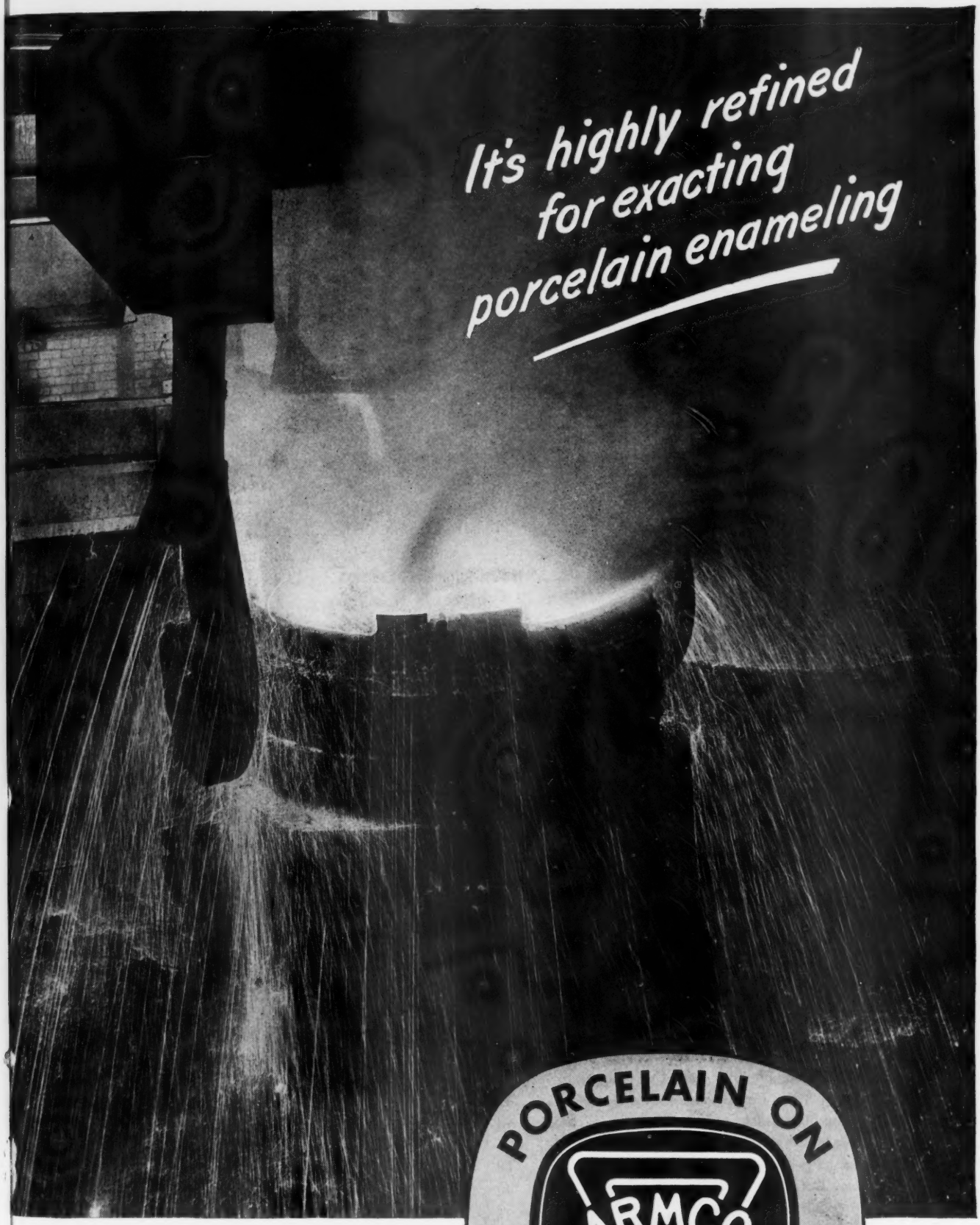
**FLINT & SPAR CO., Inc., TRENTON, N. J.**

*Specializing in:*

- CONNECTICUT BODY FELDSPAR
- CONNECTICUT GLAZE SPAR
- CRYSTAL ROCK QUARTZ
- AMERICAN SAND FLINT
- ENGLISH CORNWALL STONE
- ENGLISH WASHED FLINT
- Our new mill in Connecticut provides faster delivery to potteries particularly in middle western states.
- EUREKA SERVICE covers the pottery Industry.

*Our Western Representative:*

DONALD HAGAR . . ZANESVILLE, OHIO




PORCELAIN ON
ARMCO
INGOT IRON

ARMCO Enameling Iron is refined at higher temperatures for a longer time, to give it the exceptional uniformity that enamelers want. Here the molten metal is pouring from a furnace into a ladle. The American Rolling Mill Company, Export, Armco International Corp., 101 Curtis Street, Middletown, Ohio.

*SPEED VICTORY - WITH WAR BONDS!*

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*You can use*

**CHICAGO VIT FRITS**

*. . . with Confidence*

CHICAGO VITREOUS has long maintained the most modern and advanced laboratory in the porcelain enamel industry. The above picture is a view of the main room (50′ x 100′). This room is flanked by smaller rooms devoted to special purposes.

CHICAGO VIT'S laboratory is manned by men who are acknowledged leaders in the industry. They are not only technically trained, but schooled through years of practical field experience. No contemporary can make that statement.

Through close coordination between the development laboratories and the sales and service activities, this research staff has the pulse of the industry in every undertaking. By means of a system of development projects, the long-range research is kept active while current problems are being handled.

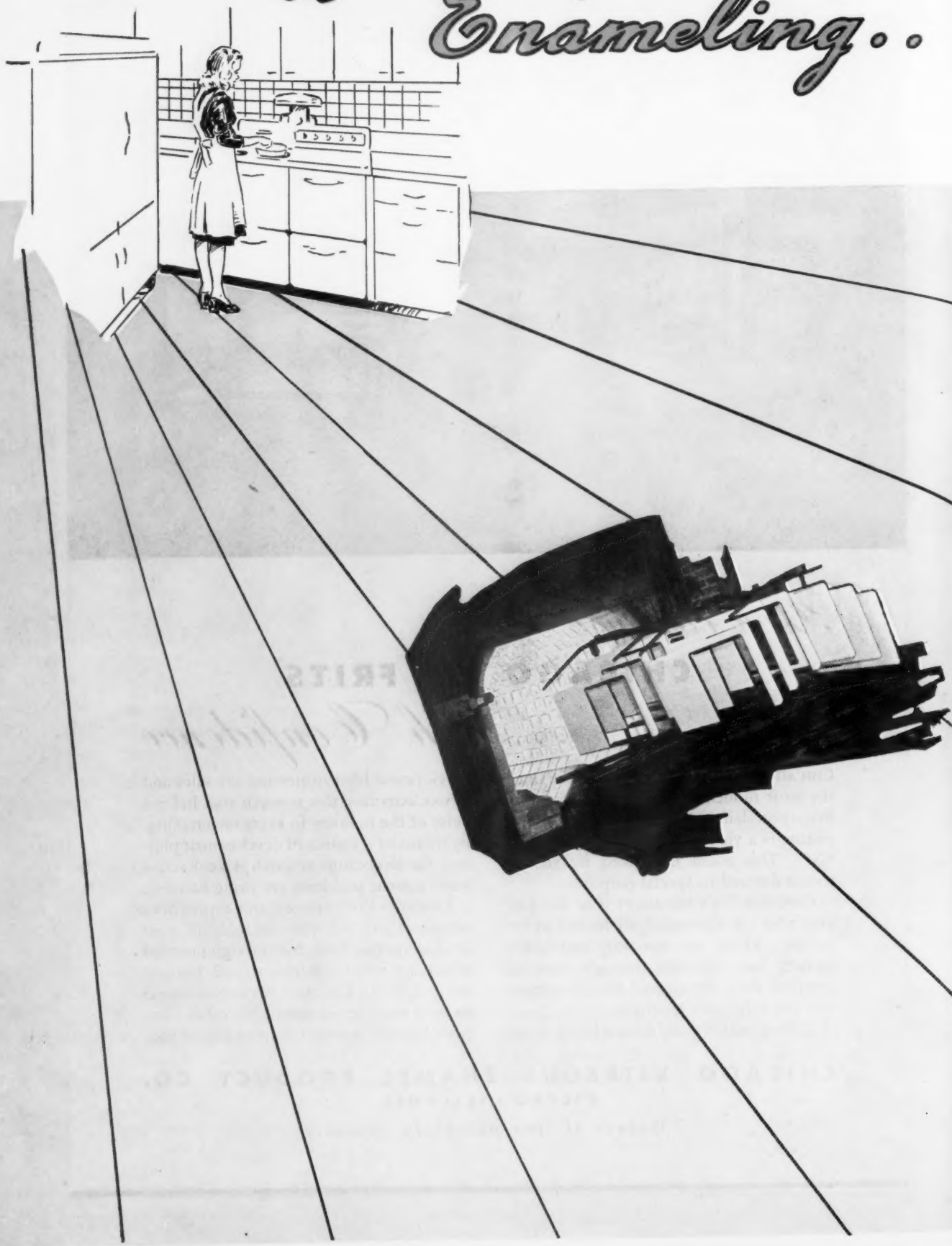
CHICAGO VIT'S trained and experienced personnel can aid you not only in your production problems, but through practical advice on plant equipment and layouts. And, of course, CHICAGO VIT has an enamel to meet every requirement. No other company has such a comprehensive line of frits.

**CHICAGO VITREOUS ENAMEL PRODUCT CO.**

**CICERO • ILLINOIS**

*Makers of fine porcelain enamels*

# For Efficiency in Enameling..



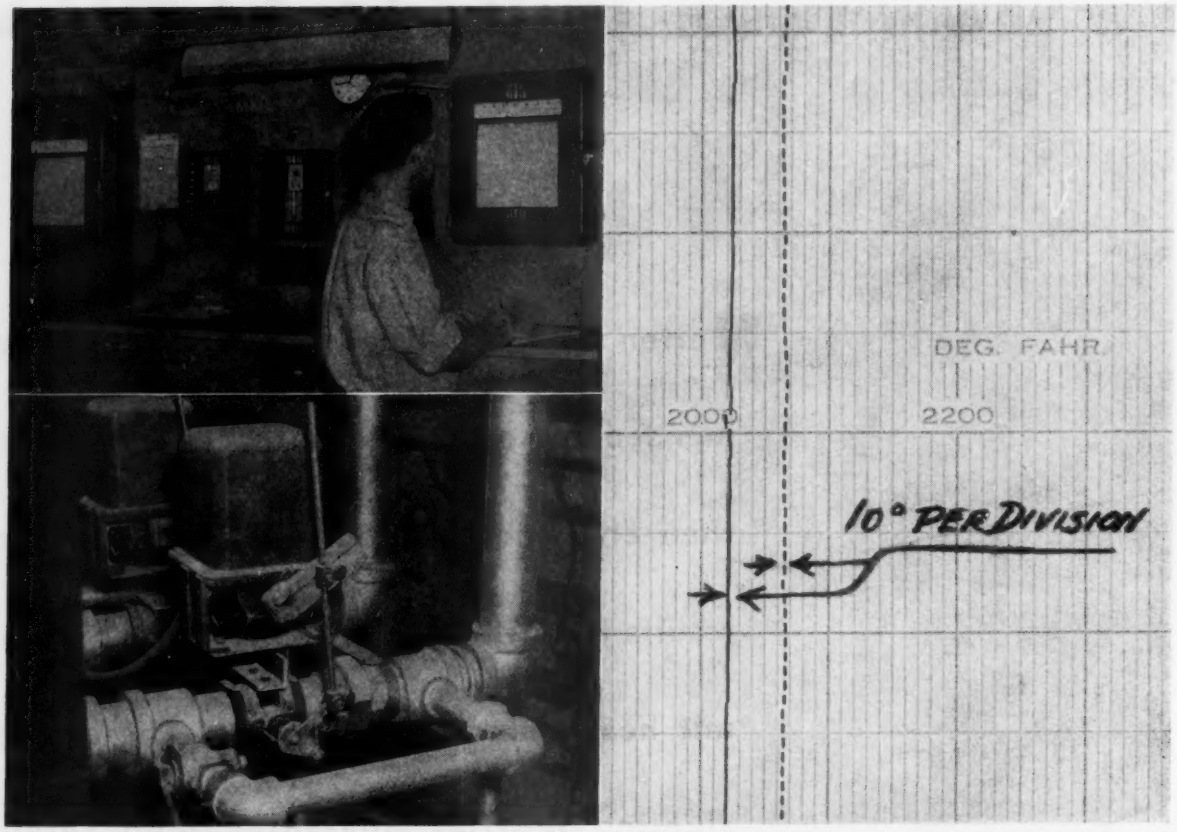
# . Alundum MUFFLE PLATES

Norton ALUNDUM Muffle Plates are recommended for enameling furnaces because of their efficiency and long life. The efficiency results from their ability to effectively transmit heat from source to ware. These fused alumina muffles guarantee long service because of their high refractoriness, chemical inertness, and great strength which permits thinner cross-section for heat transfer.

R-870

**NORTON COMPANY**
WORCESTER 6, MASSACHUSETTS

**Norton** Longer Lasting **Refractories**




Closeups of Micromax Control Equipment for gas-fired muffle-less kiln used by Lenox, Inc., Trenton, N. J. At top, the kiln operator consults pyrometer's chart. Below, two valve drives which throttle gas to both burner zones. At right, a 1½-hour portion of a typical Micromax chart shows the uniformity held during the entire heat by the Micromax pyrometer.

# TEMPERATURE OF LENOX WARE Stays Within 7°F In Micromax-Controlled Kiln

In regular, day-in-and-day-out firing of ware in their Allied bisque kiln, Lenox, Inc., has proved time and again that the kiln's Micromax Pyrometer is controlling hot-zone temperature uniformly to within only 7 degrees, at all points in a given car section. Though the kiln is muffle-less and direct-fired with gas, and the method of setting is in open rings instead of saggers, the control instruments are entirely standard.

A single Micromax Pyrometer controls both preheat and firing zones. Fuel is pre-mixed with air, and fed to the 87 Selas radiant burners through two burner manifolds—one for each zone. In each manifold is a valve, throttled up and down as necessary by a L&N valve-drive which is directed by the Pyrometer. By reason of the responsiveness of the equipment, temperature is held within limits which Lenox considers "perfect."

Also on this kiln's panel is a Micromax $CO_2$ Recorder, known for simplicity and dependability. Its wide-scale record helps to be sure that excess air is at all times correct.

If you wish further information either on pyrometers or $CO_2$ recorders, let us know.

LEEDS & NORTHRUP COMPANY, 4990 STENTON AVE., PHILA., PA.

LEEDS & NORTHRUP

MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES

Jrl Ad N-664-0720(1)

## MONTGOMERY PORCELAIN PRODUCTS COMPANY

SPECIALIZING IN
**Primary Protection Tubes for all makes of Pyrometers**

**MONTGOMERY**

**PYROMETER TUBES**

★ MULLITE

★ REFRACTORY PORCELAIN

MONTGOMERY PORCELAIN PRODUCTS CO.
FRANKLIN OHIO

*Fifty Years Experience Manufacturing Fans and Ventilating Machinery*

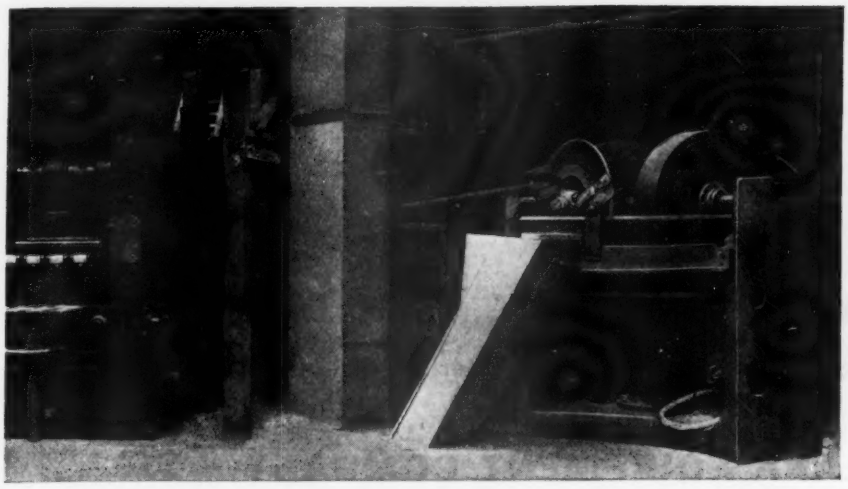
## ROBINSON VENTILATING CO.

ZELIENOPLE, PA.

**For fifty years we have been serving mining and industrial enterprises.**

**For fifty years we have continuously improved our products and services.**

***"STRENGTH and QUALITY"***



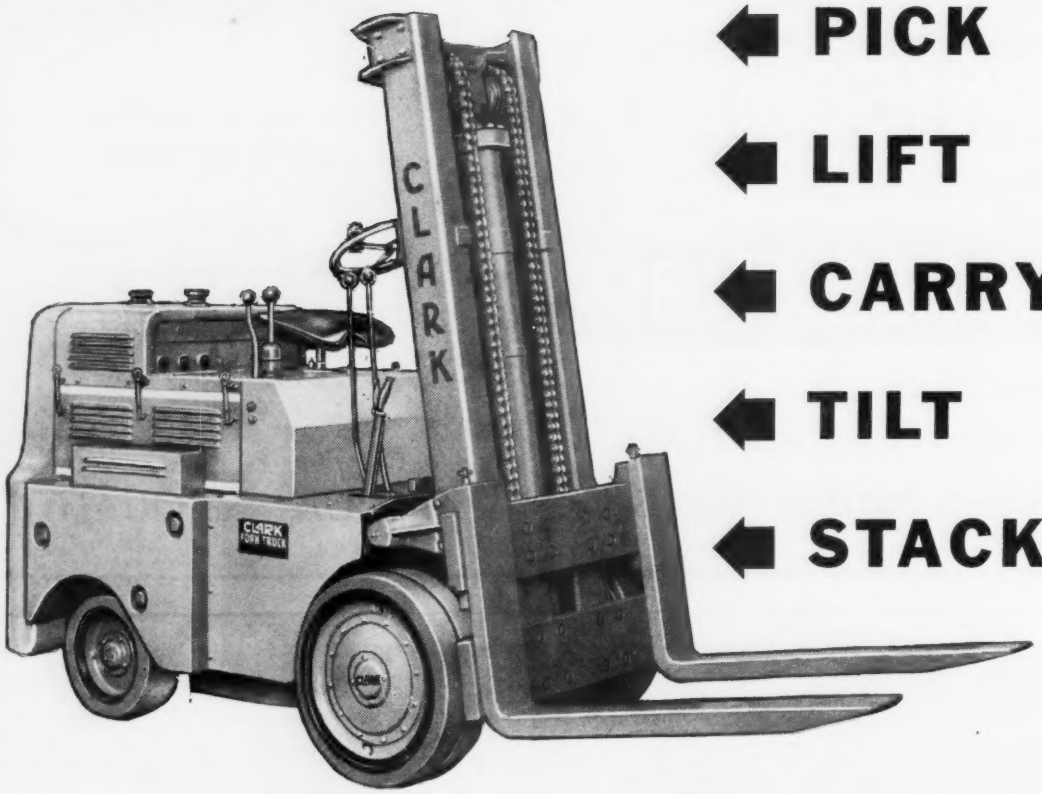
*Clearfield 610 Mixer preparing dry press refractories.*

The CLEARFIELD (muller type) Mixer is the most efficient means of blending and tempering various raw materials used in the ceramic and allied industries.

We shall be glad to furnish information if advised of your requirements.

**CLEARFIELD MACHINE COMPANY**
Clearfield, Penna.

# CLARK FORK TRUCKS




PICK
LIFT
CARRY
TILT
STACK

*Materials*

*Saving* MANPOWER, TIME, COST, FLOOR SPACE

plus delivering the goods on time to and from factories, yards, docks and warehouse

A Product of
CLARK EQUIPMENT COMPANY

*Post War Engineering Service Available, Write—We Are Ready to Serve You.*

CLARK TRUCTRACTOR
DIVISION OF CLARK EQUIPMENT COMPANY
BATTLE CREEK, MICHIGAN, U.S.A.

# RELIABLE REFRACTORIES

MADE FROM

# KENTUCKY CLAYS

FOR

GLASS TANK FURNACES
GLASS POT FURNACES
REGENERATORS
TUNNEL KILNS
PERIODIC KILNS
GAS MACHINES
FRIT FURNACES
CHEMICAL PRODUCT FURNACES
MUFFLE FURNACES
LEHRS

*Consult Us On Your Refractory Problems*

THE IRONTON FIRE BRICK CO.
*Reliable Refractories*
IRONTON, OHIO

## SMOOTH PERFORMANCE MAKES

# UVERITE

## THE STAND-OUT

# OPACIFIER

## *for...* porcelain enamel

Smooth performance makes Uverite rate ace-high with production men. ★ ★ The opacity and coverage of Uverite Enamels run uniformly high. Burning range and clean surface make Uverite Enamels easy working. ★ ★ These are a few outstanding qualities which indicate why more production men use Uverite than any other opacifier. When you want a better, whiter surface . . . use Uverite as your mill addition opacifier. Large stocks are available and shipments are unrestricted.

HARSHAW

THE HARSHAW CHEMICAL CO.
1945 East 97th Street, Cleveland 6, Ohio
BRANCHES IN PRINCIPAL CITIES

*. . . DON'T FORGET . . .*

*. . . That*

*QUALITY BALL CLAYS PRODUCE BETTER WARE*

**While at the Meeting**
**(Second War Conference)**
**Visit with and consult**
**V. J. Roehm**
**and**
**W. J. Watkins**
**At Hotel William Penn**

KENTUCKY CLAY MINING COMPANY, Inc.
MAYFIELD, • • • • • KENTUCKY

**EDWIN M. KNOWLES CHINA CO.**

*Increases production with*

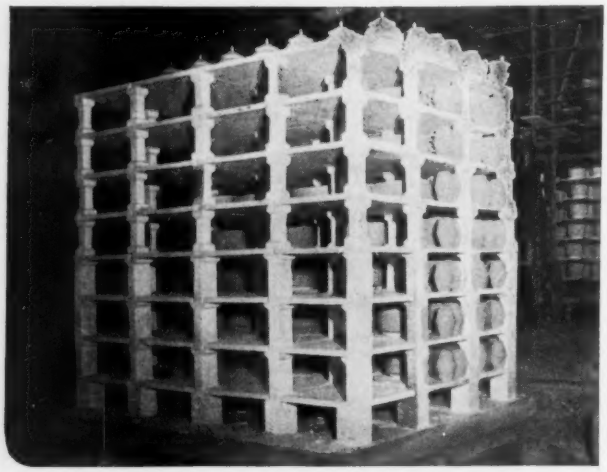
# P. B. SILLIMANITE

## TUNNEL KILN CAR SETTING

*Service Records* • **P.B.SILLIMANITE CARS** • *front to rear*

CAR #334..... 15 Trips
CAR #337.....123 "
CAR #399.....115 "
CAR #372.....122 "

All still going—No replacements to date.



*Here are the facts as secured from the Edwin M. Knowles China Company*

- WARE . . . Semi-vitreous tableware
- KILN . . . Harrop continuous tunnel kiln. 327′–0″ long
- NO. OF CARS . . . 50
- FIRING TEMP. . . . Cone 10 1/2 down
- KILN CYCLE . . . 62 1/2 hrs.
- AVG. LOAD PER SLAB . . . 35 lbs.
- SIZE OF SLAB . . 17 1/2 x 18 1/4 x 1″

Taking into account cost of P. B. SILLIMANITE Car Setting vs. savings effected by the elimination of saggers, it was estimated that the cars would cancel their investment at 100 trips. Cars shown in the accompanying photographs have run from 123 to 269 trips.

***Illustrated at Right*** . . . . .
Car No. 334 after 15 trips, showing combination of TAYLOR Floating and Fully Supported Slabs and Posts. The TAYLOR design eliminates the superimposed load on the slabs in the lower decks and allows free expansion and contraction. This materially reduces slab breakage and also makes it possible to replace individual slabs in the lower tiers without disturbing the balance of the same.

●

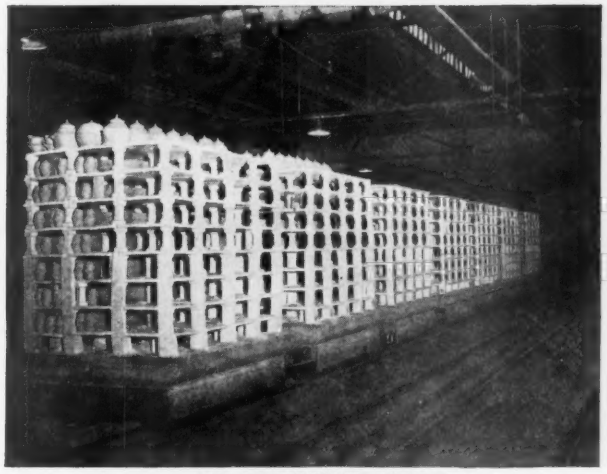
*other*

**TAYLOR REFRACTORIES**

*supplied for*

**KILN CONSTRUCTION and REPAIRS**

**TYSON-Vacuum Pressed Fire Brick**
**TAYCO Refractories Cement**
**TAYLOR INSULATING FIRE BRICK**
**MONOCRETE • LITECRETE**
**P. B. SILLIMANITE REFRACTORIES**
**HYDROCAST**
**P.B. SILLIMANITE Sagger Patch**
**TAYLOR ZIRCON BRICK • SHAPES**
**KILN PLATES and CENTERS**



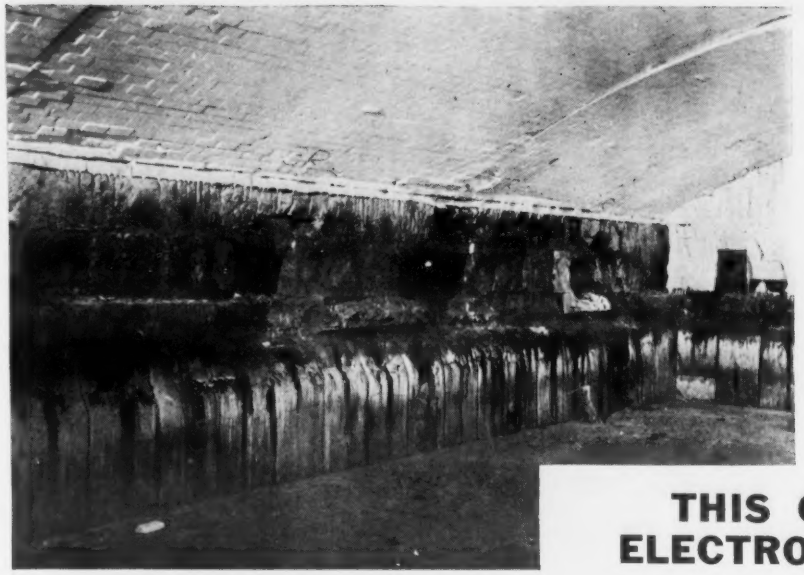
*Service Records* • **P.B. SILLIMANITE CARS** • *left to right*

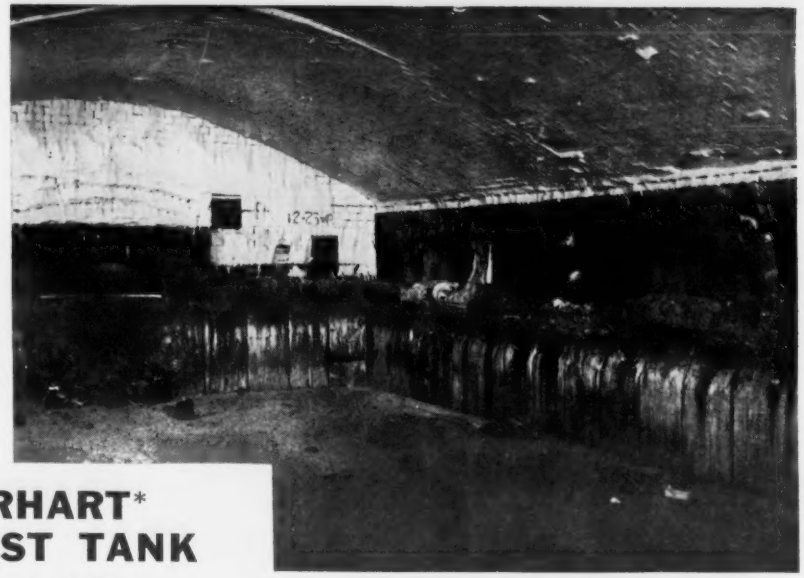
CAR #268...117 Trips.
Replaced 10 Slabs after 77 trips.
CAR #400...193 Trips. Built Aug. 16, 1940.
18 P. B. SILLIMANITE Slabs have been replaced in this time.
CAR #55....117 Trips.
CAR #409...269 Trips. This car rebuilt at 266 trips using P. B. SILLIMANITE Plates and Posts salvaged from #409 and one other car.

*All photos courtesy of Edwin M. Knowles China Co. Newell, W. Va.*

**CHAS. TAYLOR SONS Co.**

MANUFACTURERS OF REFRACTORIES • CINCINNATI • OHIO • U. S. A.





## THIS CORHART* ELECTROCAST TANK

**ran 1199 days—produced 104,890 tons of flint and amber glass (153.3 tons per square foot per life).**

**Corhart Refractories Company,** ***Incorporated,***
16th and Lee Sts., Louisville 10, Kentucky

* *Not a product, but a registered trade-mark.*

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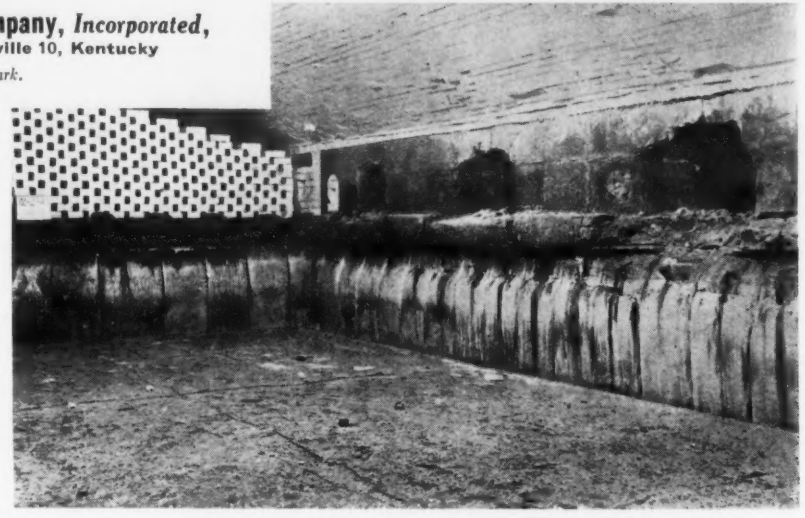

# Ceramic Abstracts Section

Compiled by

## THE AMERICAN CERAMIC SOCIETY


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PERIODICAL REFERENCE: The name of the periodical appears in italics, followed by the volume (bold-faced), issue number (in brackets), page numbers, and year (in parentheses).


**Vol. 23** **March 15, 1944** **No. 3**


## Abrasives

**Boyer-Schultz universal tool bit grinding fixture.** ANON. *Machinery* [N.Y.], **50** [5] 192 (1944).—The Boyer-Schultz Corp., Chicago 12, Ill., has developed a Model G universal tool-bit grinding fixture for grinding screw machine tool bits. R.H.B.

**Circular relief grinder for bent shank taps.** ANON. *Machinery* [N. Y.], **50** [5] 192 (1944).—A true circular relief can now be ground on bent-shaft or long-lead taps with the circular relief grinder equipped with special attachments manufactured by the Cleveland Tool Engineering Co., Cleveland 13, Ohio. R.H.B.

**Engis "Hyprez" precision finishing service for metal parts.** ANON. *Machinery* [N. Y.], **50** [5] 186 (1944).—A method of applying a high-precision finish to metal parts known as "Hyprez" has been developed by the Engis Equipment Co., Chicago 4, Ill. This company is prepared to apply the finish to parts already made or to supply complete parts, finished by the new method, ready for assembly. The Hyprez finish is obtained by using abrasives of the highest quality with a new technique developed to eliminate scratches. The method assures a finish of superior quality on surfaces previously machined, ground, honed, or lapped. The Hyprez finish is being applied to ball-bearing races, instrument pivots, cartridge-case dies, the bores of gears, hydraulic cylinders, and many other parts for which frictionless movement is desired. R.H.B.

**Hanchett vertical-spindle rotary surface grinder.** ANON. *Machinery* [N. Y.], **50** [5] 186 (1944).—A No. 24 vertical-spindle rotary surface grinder is made by the Hanchett Mfg. Co., Big Rapids, Mich. R.H.B.

**Ind-L-Way drill-grinding fixture.** ANON. *Machinery* [N. Y.], **50** [5] 200 (1944).—The Industrial Engineering Co., Inc., Chicago, Ill., has brought out the Ind-L-Way twist drill grinding fixture that can be adjusted for grinding the drill point to any angle from 30° to 90°. R.H.B.

**Securing fine surfaces by grinding: VIII.** H. J. WILLS AND H. J. INGRAM. *Machinery* [N. Y.], **50** [5] 173–75 (1944).—The balancing of grinding wheels is dealt with. Uniform truing and dressing can be obtained only when the wheel is in balance; this is imperative. Proper balancing is an operation calling for considerable skill. The best results, therefore, will be obtained by assigning all balancing to one or two men who have been thoroughly trained in the procedure. The balancing may be performed on a parallel ways device or on a set of overlapping disks mounted on a stand. If the out-of-balance is too great to be corrected by minor spindle or arbor hole adjustments, arbors equipped with balancing weights may be used. The procedure of balancing with two and four arbor weights is outlined. For Part VII see *Ceram. Abs.*, **23** [2] 33 (1944). R.H.B.

**Universal grinding applications on small parts.** ANON. *Machinery* [N. Y.], **50** [5] 165 (1944).—With a standard cam-grinding unit on a standard Norton 10-in. Type C hydraulic cylindrical grinding machine, two eight-sided cams are ground from two rounds of different diameters. The two rounds are located on each side of a disk of relatively large diameter having holes through it. R.H.B.

### PATENTS

**Abrading means.** J. T. KELLEHER (one half to American Optical Co., one half to Neveroil Bearing Co.). U. S. 2,339,270, Jan. 18, 1944 (Nov. 28, 1940).

**Abrasive.** W. E. BEATTY. U. S. 2,340,504, Feb. 1, 1944 (March 1, 1943).—The process which comprises interlocking abrasive particles by applying thereto a solution of ethyl cellulose.

**Abrasive articles, particularly flexible abrasive articles, e.g., sandpaper, and methods of making.** A. H. STEVENS (Minnesota Mining & Mfg. Co.). Brit. 557,773, Dec. 15, 1943 (July 21, 1941).

**Abrasive cutoff machine.** W. F. OBEAR AND E. F. OBEAR. U. S. 2,340,553, Feb. 1, 1944 (April 9, 1943).

**Abrasive tools and method of making.** ALNCIN, INC. Brit. 558,007, Dec. 30, 1943 (June 17, 1941).

**Adjustable hone.** J. J. PALOTCE. U. S. 2,338,963, Jan. 11, 1944 (March 25, 1943).

**Crankshaft-grinding machine.** F. M. LEUSCH. U. S. 2,340,602, Feb. 1, 1944 (Aug. 4, 1941).

**Flexible abrasive articles and processes for producing them.** A. H. STEVENS (Minnesota Mining & Mfg. Co.). Brit. 557,967, Dec. 30, 1943 (Feb. 13, 1941).

**Flexible abrasive product.** EDWARD VAN DER PYL (Behr-Manning Corp.). U. S. 2,339,208, Jan. 11, 1944 (April 4, 1941).

**Flexible backed abrasive and method of making.** H. C. MARTIN (Carborundum Co.). U. S. 2,339,500, Jan. 18, 1944 (Feb. 13, 1942).

**Grinding machine.** S. E. WOODBURY AND S. E. WOODBURY, JR. (Reid Bros. Co., Inc.). U. S. 2,340,096, Jan. 25, 1944 (Jan. 26, 1942).

**Grinding-wheel dresser.** D. F. PRICE, H. E. BALSIGER, AND M. A. HOLLENGREEN (Landis Tool Co.). U. S. 2,340,683, Feb. 1, 1944 (June 6, 1940).

**Honing machine.** H. R. BERARD (Heald Machine Co.). U. S. 22,423, Jan. 25, 1944 (July 20, 1943); reissue of original U. S. 2,290,525, July 21, 1942 (Nov. 5, 1936).

**Honing tool.** M. N. PRANGE. U. S. 2,340,767, Feb. 1, 1944 (June 9, 1941).

**Lapping tool.** A. W. HARRIS (American Steel and Wire Co. of New Jersey). U. S. 2,340,380, Feb. 1, 1944 (Aug. 15, 1942).—An intermediate lap consisting of lead containing about 1 to 4% by weight of one of the group consisting of metallic sodium, potassium, and calcium, molded into block form, and characterized by possessing deliquescence when employed in the presence of water.

**Lapping tool.** F. F. HILLIX (American Steel and Wire Co. of New Jersey). U. S. 2,340,383, Feb. 1, 1944 (April 10, 1939; Aug. 15, 1942).—A roughing lap comprising a friable composition of substantially 65% lead and 35% antimony, by weight, molded into block form, characterized by having sufficient strength to apply a cutting pressure thereby to granular abrasive of about 240- to 600-mesh, and being soft enough to become charged with the abrasive. **U. S. 2,340,384,** Feb. 1, 1944 (April 10, 1939; Aug. 15, 1942). **U. S. 2,340,385** and **2,340,386,** Feb. 1, 1944 (Aug. 15, 1942).

**Making abrasive articles.** CARBORUNDUM CO. Brit. 557,714, Dec. 15, 1943 (Nov. 7, 1941).

**Making abrasive articles and apparatus therefor.** J. S. SMYSER (Minnesota Mining & Mfg. Co.). U. S. 22,419, Jan. 11, 1944 (April 24, 1931); reissue of original U. S. 1,788,600, Jan. 13, 1931 (Feb. 7, 1924); renewed April 14, 1930.

**Method and means for forming and dressing grinding wheels.** COVENTRY GAUGE & TOOL CO., LTD., AND M. JELLIS. Brit. 557,946, Dec. 22, 1943 (Aug. 14, 1942).

**Portable grinding machine.** E. A. HALL AND R. S. BEVERLIN (Hall Mfg. Co.). U. S. 2,338,763, Jan. 11, 1944 (Jan. 19, 1943).

**Safety device for machine tools.** SHINKURO MIKAMI (vested in the Alien Property Custodian). U. S. 2,340,547, Feb. 1, 1944 (Aug. 9, 1940).

**Safety device for machine tools using photoelectric tubes.** SHINKURO MIKAMI (vested in the Alien Property Custodian). U. S. 2,340,548, Feb. 1, 1944 (Aug. 9, 1940).

## Art and Archeology

**Color designations for lights.** KENNETH L. KELLY. *Jour. Research Nat. Bur. Standards,* **31** [5] 271–78 (1943); RP 1565. Price 5¢.—The ISCC-NBS system of color names for the description of the colors of drugs and medicines has been extended for describing the colors of lights. The color names consist of hue names, such as red, pink, yellowish green, or purple, without further modifiers, as they are intended to differentiate lights chiefly according to hue. R.A.H.

**Fifty years of decorative and table glassware.** MARVIN G. YUTZEY. *Bull. Amer. Ceram. Soc.,* **23** [2] 70–72 (1944).

**Flowering of Turkish tile: I.** FRITZ FICHTNER. *Ber. Deut. Keram. Ges.,* **24** [6/7] 173–200 (1943).—F. presents a historical review of ceramic decorative tile and its use in adorning buildings and monuments in Turkey. Eleven reproduction plates are included. **II, Analysis of form and style of Turkish tile. III, Foreign influences and the influence of Turkey on foreign art.** *Ibid.,* [8/9] 237–63.—Six more reproductions and an extensive bibliography are included. M.HO.

**Interesting and accidental reduced-copper on-glaze effect.** A. L. HETHERINGTON. *Trans. Brit. Ceram. Soc.,* **42** [9] 183 (1943).—Owing to an incendiary bomb in a warehouse in London, Japanese ash trays with a crackled blue-green glaze were subjected to the heat caused by the conflagration. Bronzes were present in the same room. After the fire the glaze on the trays had turned red, illustrating the reduced-copper on-glaze effect discussed by J. W. Mellor (*Ceram. Abs.,* **16** [11] 352 (1937)). R.A.H.

**Practical production of one-fire luster-glazed pottery.** FORREST BURNHAM AND CHARLES M. HARDER. *Jour. Amer. Ceram. Soc.,* **27** [2] 62–64 (1944).—5 references.

**Promote American ceramic designs.** WALTER A. WELDON. *Bull. Amer. Ceram. Soc.,* **23** [2] 57–58 (1944).

**Frederick Hurten Rhead, founder of the Art Division.** PAUL E. COX. *Bull. Amer. Ceram. Soc.,* **23** [2] 64–65 (1944).

PATENTS

**Casserole design.** H. I. KLEINBERG. U. S. 137,117, Jan. 25, 1944 (Nov. 18, 1943).

**Cookie jar design.** J. B. LENHART (American Pottery Co., Inc.). U. S. 137,119 and 137,120, Jan. 25, 1944 (Nov. 13, 1943).

**Process and apparatus for decorating articles of manufacture.** G. H. CAMPBELL (Solar Laboratories). U. S. 2,340,643, Feb. 1, 1944 (Oct. 14, 1940).

**Service dish design.** H. I. KLEINBERG. U. S. 137,118, Jan. 25, 1944 (Nov. 18, 1943).

## Cements

**Cement-plant conversions important 1943 development within industry.** ANON. *Pit & Quarry,* **36** [7] 123–29 (1944).—The conversion, in 1943, of many cement plants for the manufacture of lime, beneficiated iron ore, phosphate, and magnesium is discussed. New cement plants are described. 11 photographs. M.R.

**Dicalcium silicate solid solutions.** KENNETH T. GREENE. *Jour. Research Nat. Bur. Standards,* **32** [1] 1–10 (1944); RP 1570. Price 10¢.—X-ray diffraction, optical, and thermal data are presented as evidence that at high temperatures $2CaO \cdot SiO_2$ forms, with $Na_2O$ and $Al_2O_3$ and with $Na_2O$ and $Fe_2O_3$, solid solutions which have hexagonal crystal structures. These solid solutions probably possess the fundamental crystal lattice of $\alpha$-$2CaO \cdot SiO_2$. The oxides in solid solution preserve the $\alpha$ form so that it may be quenched to room temperature. The $\alpha$-$\beta$ inversion temperature of the crystalline phases described was lowered to a minimum of about 1175° to 1180°C. Accompanying the inversion to $\beta$-$2CaO \cdot SiO_2$ is the precipitation of much of the material held in solid solution in the $\alpha$ form. With preparations containing both $Na_2O$ and $Al_2O_3$, there appears to be an inversion interval over which both modifications may exist in equilibrium. A possible explanation is given on the basis of the solid-solution relations. Data are given to support the view that complex twinning in $2CaO \cdot SiO_2$, as observed in laboratory charges and in Portland cement clinker, is evidence that the inversion from the $\alpha$ to the $\beta$ modification has already taken place. G. concludes from optical and X-ray data that in the compositions studied the amount of solid solution in $\beta$-$2CaO \cdot SiO_2$ is very small in comparison with that which may exist in the $\alpha$ form. A brief discussion of the industrial significance of the results is given. R.A.H.

***Grindability of blast-furnace slags (cement slags) and clinkers.** G. MUSSGNUG. *Zement,* **31** [17/18] 183–93 (1942).—The grindability of a number of blast-furnace slags and of several kinds of rotary-kiln clinkers was tested in a laboratory mill under exactly the same conditions. The results of the laboratory tests were later checked under plant conditions. The tested slags and clinkers differed widely in their behavior during grinding. The grindability of slags depended largely on their volume weight. The resistance to grinding increased almost linearly with increasing volume weight. The effect of the chemical composition on the grindability of rapidly cooled basic slags is very small unless it also affects the volume weight. With respect to their grindability, the slags could be divided into three groups on the basis of their

volume weight: (1) easily ground, 200 to 600; (2) medium, 600 to 1200; and (3) difficultly ground, above 1200 gm. per liter. No clear conclusions could be drawn from the behavior of the rotary-kiln clinkers. The $3CaO \cdot SiO_2$ and $2CaO \cdot SiO_2$ contents seem to have some effect. Generally, clinkers with a low $C_3S$ and a high $C_2S$ content were hard to grind. There exist opinions that, in making cement, the slag and the clinker should be ground together. M. points out the fallacy of such opinion, especially when working with an easily ground slag and a difficultly ground clinker. The proper utilization of various units in a grinding process is of paramount importance for the efficiency and economy of the process, e.g., it is wasteful to crush the material in a fine-grinding mill. Details are discussed. M.Ho.

* **Heat of hydration.** KURT WÜRZNER. *Zement*, **31** [25/26] 269–73 (1942).—With the aid of the Killig apparatus it is possible to estimate the relation between the quality of cement and its heat of hydration. The results obtained in a laboratory, however, at best only approximate the conditions existing in large-scale construction practice. The choice of a cement for a large-scale building program should be made only on the basis of actual building experience. Not only alumina cement, but trass cement, cement and blast-furnace slag, $Fe_2O_3$-rich cements, and Portland cement will also be used if conditions warrant them. Heat of hydration curves of several cements are reproduced. M.Ho.

**Jointing cements: formulas and applications.** BURROWS MOORE. *Ind. Chemist*, **19** [216] 21–24 (1943).—A list of suitable cementing materials for joining various connecting links in a chemical plant is given. The maximum temperature of use is indicated, as well as their principal characteristics and applications. H.E.S.

* **Procedure for determining alkalis in cement.** F. GILLE. *Zement*, **31** [19/20] 207–209 (1942).—This method for determining Na and K is a modification of the Berk-Roller method ("Direct. . . ," *Ceram. Abs.*, **14** [9] 209 (1935)). Briefly, the procedure is as follows: Decompose a 0.5-gm. sample by the J. Lawrence Smith method. Place the fusion in $H_2O$ and wash by decantation. Transfer onto a filter and wash with cold limewater. Weakly acidify the filtrate with HCl and add $BaCl_2$ to precipitate $SO_4$. Without filtering, heat and add $NH_4OH$ and $(NH_4)_2CO_3$ to precipitate the sesquioxides and Ca. If this precipitate is voluminous, reprecipitate or else carefully evaporate the filtrate. Carefully fume off the $NH_4$ salts. Take up the residue with a little hot $H_2O$. Filter through a small filter into a 100-ml. volumetric flask. Remove with a pipette 20 ml., place into a porcelain dish, and concentrate to 1 ml. Determine Na with uranyl zinc acetate. The filtrate from the $SiO_2$ determination by the Maczkowske procedure can also be used for determining Na. The procedure is the same as above. For determining $SiO_2$ a 1-gm. sample is taken, but only a 10-ml. aliquot of the solution in the volumetric flask is used for the Na determination. K is determined on another aliquot from the volumetric flask. K is precipitated as the salt of hexanitrodiphenylamine (*Angew. Chem.*, **46**, 827 (1933)). The Mg salt of hexanitrodiphenylamine, which is now available commercially, is used for precipitation. The advantages of this modification are as follows: (1) The Ca and Mg do not have to be removed very carefully; it suffices to remove them to the extent where they do not cloud the final 1-ml. concentrate. (2) The conversion factors are very small, 0.02015 for $Na_2O$ and 0.0987 for $K_2O$, and therefore the sensitivity of the method is great. Details of procedure are given. M.Ho.

* **Sedimentation volume of aqueous suspensions of cement.** HUGO VIERHELLER. *Zement*, **31** [25/26] 276–77 (1942).—V. reviews previous experiments and describes new ones showing that the sedimentation volume of a cement suspension depends on the state of flocculation of the cement. A flocculated cement gives a large loose sediment, whereas the sediment of a deflocculated cement is smaller and more compact. This is reflected in the weight per volume of dry sediment. To prevent flocculation, wetting agents are added to the suspension, including Na lignosulfate, Na triethanolamine, protein degradation products, etc. Patents protecting the use of deflocculants in cements are reviewed. V. quotes some investigators who attribute the flocculating effect in cements to gypsum. See "Volume. . .," *Ceram. Abs.*, **22** [6] 99 (1943). M.Ho.

* **Slope and number of revolutions of rotary kilns.** W. BOHMAN. *Zement*, **31** [27/28] 291–93 (1942).—For the efficient operation of rotary kilns, their diameter, slope, and number of revolutions per unit time should be properly correlated. The diameter is determined by the desired output; therefore the other two should be adjusted to it and to each other. To enable the calculation of this interdependence, B. introduces two new concepts: pitch and forward motion (*Vorschub*). To explain the pitch, B. analyzes the path a particle travels in a rotating kiln. The particle describes a spiral having a certain pitch. By "forward motion" B. designates the rate of travel of a particle along a longitudinal path of the kiln. The pitch is given by $h = (d \cdot \pi \cdot i)/100$ in mm., where $d$ is the internal diameter of the kiln and $i$ is the slope in %. The "forward motion" is given by $s = h \cdot n$ in mm. per min., where $n$ is the r.p.m. With the aid of these formulas, B. derives a series of other formulas which can serve as guides for the construction of new kilns. M.Ho.

* **Weight of dry matter per cubic meter of a Portland cement slurry at a varying water content.** HANS HEIN. *Zement*, **31** [25/26] 273–76 (1942).—In Portland cement works operating on the wet-process principle it is frequently necessary to calculate the weight of dry matter per cubic meter of cement slurry. Cement plants long in operation and using the same source of raw materials and the same composition of the mix have this problem greatly simplified. In such instances, the weight of dry matter is readily calculated from the moisture content. The latter is easily determined in a short time and with a minimum of equipment. The problem becomes more complicated and requires more time and equipment in newly started plants or in plants with a variable source of supply. The dry-matter content per cubic meter can be calculated from the formula $f = s_n\left(1 - \frac{a}{100}\right)$, where $f$ = weight in tons per cu. m., $s_n$ = the specific gravity of the moist sludge, and $a$ = the water content of the slurry in weight per cent. For calculating $f$, $s_n$ and $a$ must be determined each time; $s_n$ can be replaced by $s_n = \frac{100}{\left(\frac{a}{d_w} + \frac{100 - a}{s_t}\right)}$, where $a$ is as before, $d_w$ = the density of $H_2O$, which at 20°C. can be stated $d_w = 0.9972$, and $s_t$ is the specific gravity of the dry sludge. The formula can be now written $f = \frac{(100 - a) \cdot s_t}{100 + a(1.0028s_t - 1)}$; $s_t$ is reasonably constant if the raw material and the composition do not vary too much. As a fairly accurate value for $s_t$, 2.7 may be accepted. This value can be corrected from time to time if the mineralogical composition of the mix changes. The formula then becomes $f = \frac{2.7(100 - a)}{100 + 1.707a}$. From this formula a table is compiled giving $f$ for various values of $a$. M.Ho.

SEPARATE PUBLICATION

**Collection of Works Dealing with New Building Materials and Constructions** (Sbornik Rabot po Novym Stroĭmaterialam i Stroikonstruktsiyam). Armyanskiĭ Nauchno-Issledovatel. Inst. Stroimateriyalov, Erevan, 1940. 159 pp. Price 5R.—This is a series of articles dealing with (1) artificial stone made from lime, pumice stone, and tufa; (2) artificial stone on a carbide of lime and sand base; (3) thermoinsulating diatomaceous brick; (4) magnesium cement, etc. M.V.C.

PATENT

**Cement composition and method of making.** MASTER BUILDERS CO. Brit. 557,721 to Brit. 557,723, Dec. 15, 1943 (Aug. 14, 1941).

* Obtained from microfilm.

## Enamel

**Effect of composition and temperature on solubility of iron oxide in ground-coat enamel glass.** A. I. ANDREWS AND HOWARD R. SWIFT. *Jour. Amer. Ceram. Soc.*, **27** [2] 46–50 (1944).—7 references, 4 figures.

PATENT

**Vitreous enameling.** L. J. FROST AND C. H. COMMONS, JR. (Titanium Alloy Mfg. Co.). U. S. 2,339,260, Jan. 18, 1944 (March 11, 1942).—The process of producing an enamel frit which comprises adding to the glassforming materials of the raw batch zirconium silicate and aluminum phosphate in such proportions that the mixture contains 7 to 15% zirconium silicate and 0.25 to 4% aluminum phosphate.

## Glass

**Aging thermometers.** NELSON W. TAYLOR AND BRADFORD NOYES, JR. *Jour. Amer. Ceram. Soc.*, **27** [2] 57–62 (1944).—9 references, 6 figures.

**Effect of glass on alcoholic products stored in bottles at room temperature for three years.** A. HERMAN AND H. L. SHAY. *Jour. Amer. Ceram. Soc.*, **27** [2] 53–57 (1944).—2 references, 5 figures.

**Factors affecting the degree of homogeneity of glass.** F. V. TOOLEY AND R. L. TIEDE. *Jour. Amer. Ceram. Soc.*, **27** [2] 42–45 (1944).—2 references, 5 figures.

**Fiberglas a new servant of industry.** ANON. *Mfrs. Record*, **110** [4] 22–23, 56 (1941).—A brief account of the production and commercial applications of Fiberglas textile fiber and Fiberglas wool is given. 5 photographs. See *Bull. Amer. Ceram. Soc.*, **22** [3] 60–64 (1943). M.R.

**Glass used for masonry.** ANON. *Mfrs. Record*, **110** [7] 37 (1941).—The Asheville, N. C., plant is the most modern of all Coca-Cola plants in design, construction, and mechanical equipment. It is the first plant in the U. S. to use Glastone, which is a glass-faced, load-bearing masonry unit in color. Glastone consists of a structural flat glass (Vitrolite) facing bonded to a solid, lightweight, concrete backing. The Glastone blocks are built into and become an integral part of the building wall. The nonporous surface of the glass will not stain. 1 photograph. M.R.

**Grinding procedures set for glass gauges.** ANON. *Amer. Machinist*, **88** [1] 83–86 (1944).—Glass gauges are being used with great success on brass and steel but not for Al. General information on the manufacture of good glass gauges is given; two operations, rough and finish grinding, are recommended to produce glass gauges of high accuracy and transparency. Specifications are as follows:

| | Rough grinding | Finish grinding |
|---|---|---|
| Wheel size | 3/4 x 3/4 x 1/4 in. | 3/4 x 3/4 x 1/4 in. |
| Abrasive | Silicon carbide | Silicon carbide |
| Grit size | 100 | 500 |
| Bond | Vitrified | Shellac |
| Grade | Soft | Soft |
| Speed | 12,000 r.p.m. | 12,000 r.p.m. |
| Dressing tool | Diamond | Diamond and glazed with hard steel |
| Work speed | 225 r.p.m. | 225 r.p.m. |
| Table traverse | 50 in./min. | 20 in./min. |
| Feed per pass | 0.0005 in. | 0.0002 in. |
| Total feed | 0.0300 in. | 0.005 in. |
| Finish | 6–8 micro-in. | 1–1 1/2 micro-in. |

The use of a small amount of lubricant, where tolerance permits, is desirable; the wear of glass against glass without lubricant and without carefully cleaned cavities is rapid. See "Glass for precision. . .," *Ceram. Abs.*, **22** [10] 170 (1943). M.Ha.

**Measurement of the refractive index and dispersion of optical glass for control of product.** HELEN L. GUREWITZ AND LEROY W. TILTON. *Jour. Research Nat. Bur. Standards*, **32** [1] 39–44 (1944); RP 1572. Price 5¢.—Commercial critical-angle refractometers are inadequate for acceptance tests on optical glass for precision uses. To facilitate spectrometer determinations, coefficients have been devised which, together with a table of natural sines and slide-rule operations, permit the computation of refractive indices of glass with an accuracy of $\pm 3 \times 10^{-6}$ from minimum-deviation data taken on prisms having angles of $60° \pm 30'$. R.A.H.

**New glass plant for Texas.** ANON. *Mfrs. Record*, **111** [2] 38 (1942).—The Owens-Illinois Glass Co. plans a two-furnace glass-container factory at Waco, Texas. The plant's capacity of 90 to 100 tons daily will be devoted to a general line of glassware, exclusive of milk bottles. 1 photograph. M.R.

BOOK

**Manufacture of Glass Tableware** (Proizvodstvo Stolovoĭ Steklyannoĭ Posudy). I. S. SHUR. State Publishing of Light Industry, Moscow and Leningrad, 1940, 220 pp. Price 9R.—A detailed account is given of all operations related to the production of glass tableware. After a discussion of the raw materials employed, the melting of the glass and its coloration, opacification, and decoloration are dealt with. The problems of glass furnaces used for hand and mechanized glass production and the working of hollow glassware and its packing and storing are described. M.V.C.

PATENTS

**Apparatus for handling glass articles.** B. H. KOOB (Hartford-Empire Co.). U. S. 2,340,812, Feb. 1, 1944 (Feb. 27, 1942).

**Apparatus for and method of feeding molten glass.** W. T. BARKER, JR. (Hartford-Empire Co.). U. S. 2,340,729, Feb. 1, 1944 (July 14, 1939).

**Composition of matter.** J. E. WISS (U. S. Gypsum Co.). U. S. 2,340,840, Feb. 1, 1944 (Jan. 11, 1941).—A plate glass setting composition comprising a mixture of calcined gypsum, Portland cement, potassium sulfate, and calcium chloride in the following approximate proportions by weight: calcined gypsum 96.9 to 97.3, Portland cement 2.5, potassium sulfate 0.1 to 0.5, and calcium chloride 0.1%.

**Fibrous glass product.** GAMES SLAYTER (Owens-Corning Fiberglas Corp.). U. S. 2,339,431, Jan. 18, 1944 (Aug. 22, 1942).

**Glass-handling machine.** S. F. GREIN AND P. G. MAGRINI (American Window Glass Co.). U. S. 2,340,807, Feb. 1, 1944 (Oct. 30, 1937; Jan. 26, 1942).

**Glass-processing machine.** D. E. MULHOLLAND. U. S. 2,340,201, Jan. 25, 1944 (July 17, 1942).—A prism-grinding machine.

**Making glass articles.** H. H. BLAU (Corning Glass Works). U. S. 2,339,975, Jan. 25, 1944 (Oct. 6, 1941).

**Making high-silica glass.** M. E. NORDBERG AND H. E. RUMENAPP (Corning Glass Works). U. S. 2,340,013, Jan. 25, 1944 (Nov. 18, 1938; July 20, 1940).—The method of making a glass article which comprises melting a glass, fabricating it into a fixed shape, heat-treating the article to render constituents other than silica soluble, dissolving out major quantities of the other constituents to leave a highly siliceous, substantially transparent, porous article, treating the porous article with a solution containing a salt of a metal which will color glass and containing also an aluminum salt to impregnate the article therewith, and firing the article to close the pores and incorporate the metal into the glass.

**Manufacturing mineral-wool products.** H. T. COSS (Johns-Manville Corp.). U. S. 2,338,839, Jan. 11, 1944 (Nov. 25, 1941).

**Method and apparatus for forming hollow glassware.** THOMAS WAUGH (Hartford-Empire Co.). U. S. 2,340,782, Feb. 1, 1944 (May 19, 1939).

**Method and means for uniting parts of glass by fusion.** BRITISH HEAT RESISTING GLASS CO., LTD., AND A. S. BROWN. Brit. 557,953, Dec. 22, 1943 (Oct. 30, 1942).

**Reduction in reflection from glass or other refracting materials.** RADIO CORP. OF AMERICA. Brit. 557,647, Dec. 15, 1943 (Aug. 29, 1941).

**Treating glass fibers and article made thereby.** H. P. HOOD (Owens-Corning Fiberglas Corp.). U. S. 2,339,928, Jan. 25, 1944 (Nov. 4, 1938).

**Worktable and method of laying glass sheets to be surfaced thereon.** J. L. DRAKE (Libbey-Owens-Ford Glass Co.). U. S. 2,339,158, Jan. 11, 1944 (Jan. 15, 1942).

## Structural Clay Products

* **Thermal protection and resistance to humidity of walls of metallurgical brick and metallurgical vitrified brick.** J. S. CAMMERER. *Stahl & Eisen*, **62** [24] 503–10 (1942).—The thermal conductivity of metallurgical brick was investigated on the actual walls of houses, in special buildings in the laboratory, and on the brick itself. The exact investigation made under the most diversified conditions occurring in practice showed that metallurgical brick of any manufacture gave better heat protection, in spite of higher volumetric weight and higher humidity content, than brick walls. Some of the metallurgical brick gave a 25% better result. Contrary to general experience with inorganic building materials, the thermal conductivity of dry metallurgical brick of the same volumetric weight is about 25 to 30% lower. The difference decreases with the volumetric weight and amounts in vitrified metallurgical brick to only a few per cent. The resistance to humidity varies greatly with the manufacture, which might be improved by standardization of the manufacturing process. Heating and ventilation of the rooms and the point of the compass have no practical effect. M.HA.

PATENT

**Machines for making tile, brick, etc., or for applying glaze or other material to previously manufactured tile, brick, etc.** A. G. SESSIONS. Brit. 557,809, Dec. 22, 1943 (March 10, 1942).

## Refractories

**Drying of magnesite brick: II.** J. H. CHESTERS AND T. W. HOWIE. *Trans. Brit. Ceram. Soc.*, **42** [10] 199–208 (1943).—An apparatus for measuring the hydration expansion of magnesite is described, and results are presented showing that this apparatus may be used to indicate the behavior of magnesite batches on drying in brick manufacture. It has been demonstrated, for the particular magnesites examined, that autoclave treatment yields a product which is still reactive, and it is suggested that a less severe treatment, e.g., souring on a hot floor, is more suitable for dead-burned magnesites containing a proportion of calcined dolomite. For Part I see *Ceram. Abs.*, **12** [10–11] 376 (1933). R.A.H.

**Drying magnesite products.** D. A. KISSIN. *Ogneupory*, **1939**, No. 7, pp. 455–69.—K. discusses the dynamics of the drying of magnesite raw products in detail, in particular the dependence of drying on temperature, velocity of warm air, and properties of the raw materials. The effect of technological factors, especially of the behavior of the raw materials on drying and firing, is analyzed, and attempts are made to give a theoretical explanation of the drying process of magnesite brick. M.V.C.

**Efficiency-plus speeds up manufacture of essential wartime refractories.** ANON. *Brick & Clay Record*, **103** [1] 42–46 (1943).—Production efficiency at the Harbison-Walker Refractories Co. plant, East Chicago, Ind., has been increased by improved grinding-plant operations and the installation of new mixers and batchers. A new kiln has doubled capacity, and the kiln cars are built to hold 4000 brick. B.C.R.

* **Experience with rotary kilns.** HANS PICK. *Zement*, **31** [17/18] 193–97 (1942).—P. recounts his observations on the corrosion of rotary kiln refractory linings and the inside of the iron shell. These observations were made on the kiln linings made of chamotte brick, Dynamidon, and Radex. In all instances a deposit of alkali bisulfate or alkali sulfate crystals was found on the corroded spot. Usually the crystals are colored yellow either by Cr or Fe salts. The alkali bisulfates work up through joints, crevices, etc., and when they reach the coolest spot, i.e., between the iron shell and the cement lining, they are deposited. P. attributes the origin of the corroding salts to the ashes and fly ash from the coal used for firing. He believes that freeing the heating gases of fly ash and dust would greatly reduce if not eliminate corrosion. M.HO.

**Experiences with covers for electric-arc furnaces of standard brick with insertions of metallic cooling rings.** H. MÜLLER. *Stahl & Eisen*, **63** [11] 217–21 (1943).—The factors which favorably influence the life of an acid-brick roof in basic furnace operations are discussed, and many ways of improving the roof service are described. A "standard arch brick" was developed for use in an arch with embedded cooling rings which also served as reinforcing elements in the arch. The life of the cooling rings was between 300 and 700 melts and depended largely on the cleanliness of the cooling water. The consumption of brick dropped to less than half when cooling rings were imbedded, from an average of about 18 kg. brick per ton of iron to about 7 kg. The cooling rings are arranged in such manner that the electrodes are free for some lateral movement. For furnaces 5200 mm. in diameter the roof is made 240 mm. thick and the brick are 300 mm. high. M.HA.

**Monolithic carbon linings for blast furnaces: I, Laboratory investigations.** J. C. HAYMAN. *Trans. Brit. Ceram. Soc.*, **42** [10] 185–98 (1943).—The preparation of a coke-tar mixture has been described, the data including a study of the effects of altering the charge weight of coke fed to the pan mill. The present investigations were confined to a maximum grain size of 1 mm., as recommended in the literature. From a consideration of workability, porosity, aftercontraction, fired strength, and vaporization of the volatile constituents of the tar, the optimum tar content for this specific purpose is taken to be about 10 to 11% by weight. On ignition to 600° to 900° C. in an atmosphere of town gas, such material became as strong as a German fired-carbon block due to intense bonding by the residue from the tar. The permanent shrinkage after such ignition to 900°C. is only about 0.3%, even after 60 hr. at 800° to 850°C. At 1450°C. the total shrinkage is about 1%, which would cause some shrinkage at the hot face. This could doubtless be suitably dispersed by ramming the lining in panels so that a number of radial cleavages will be formed. In the green condition an unsupported specimen subsided quite rapidly under a load of 15 lb. per sq. in. at 100°C., but this would be of importance only when the material is used as a foundation for the shell. After ignition to 900°C., the total porosity of rammed blocks was lower than that of a German fired block, while the refractoriness under load was above 1650°C. In the actual hearth, the porosity after ignition was in some cases much lower than that of the German block, hand rammers being used. Diagrams are presented indicating that the bulk density of ignited material tends to decrease as the tar

* Obtained from microfilm.

content of the batch decreases and that warming of the mixture to a temperature somewhat above 45°C. will be beneficial in the present instance even when the ramming is vigorous, the tar used being of low viscosity and having a volatile content of 73%. The heating up of the tarred material after ramming was examined to determine whether bursting would take place because of too rapid vaporization of the tar during the blowing-in, but mathematical and experimental work has indicated that no such disintegration is to be expected when a protective layer of firebrick 9 in. thick is used. R.A.H.

**Refractory chrome ore requirements of the refractory manufacturers and the steel industry.** GILBERT E. SEIL. *Mining & Met. Soc. Amer. Bull.*, **35** [1] 8 (1942).—High melting point and low chemical activity are the requirements for a chrome ore to be used in the refractories field. Magnesium silicate is the most common gangue material present as the secondary component of chrome ore. The melting point of magnesium silicate is 2350°F., making chromite unsuitable for use above this temperature. The glassy magnesium silicate bond can be crystallized by firing at 3100° to 3200°F., converting the magnesium metasilicate into the orthosilicate. This yields a chromite refractory good to above 3500°F. C.W.

**Supervision of heating up of open-hearth roofs.** F. STRÄHUBER AND R. KLESPER. *Stahl & Eisen*, **63** [12] 236–39 (1943).—The life of the roof of an open-hearth furnace is largely influenced by the manner of heating up; too fast heating is especially harmful to silica roofs, as the expansion curve of silica is entirely different from that of other refractory brick. As the transformation of the $\alpha$ cristobalite into the $\beta$ modification at 280°C. has already expanded the silica brick 73% of its final expansion at about 300° (which is completed at 650° with about 1.42%), the temperature range 0° to 300° is the most critical. The heating rate, therefore, should not exceed 10° per hr. up to 300° or, better, 400°C. and should preferably be linear. From 400° to 1600°, the heating-up rate can be faster but should not exceed 25° per hr., which means that an open-hearth furnace should not be operated until about 4 days after heating has started. Temperature recorders should be used to assure the correct heating-up period. M.HA.

SEPARATE PUBLICATION

**Mortar: Air-Setting, Refractory, Bonding (Wet and Dry Types).** *U. S. Federal Specification*, HH-M-611a. 6 pp.—Effective for use of all the departments and establishments of the government not later than Jan. 1, 1944. This specification supersedes that issued July 14, 1939, for the wet type of mortar. R.A.H.

PATENTS

**Assay crucible, etc.** R. S. BRADLEY (A. P. Green Fire Brick Co.). U. S. 2,339,454, Jan. 18, 1944 (Dec. 30, 1940).—A refractory crucible or similar refractory article composed of between 85 and 95% plastic fire clay and of between 5 and 15% ground vitreous silica.

**Magnesium compound from calcined dolomite.** C. M. SLANSKY (Dow Chemical Co.). U. S. 2,338,876, Jan. 11, 1944 (Aug. 19, 1942).

**Refractory or insulating material.** J. C. MCMULLEN (Carborundum Co.). U. S. 2,340,194, Jan. 25, 1944 (Nov. 14, 1941).—A refractory or insulating brick comprising alumina bubbles containing titania in an amount of the order of 1 to 1½%.

**Refractory manufacture.** R. H. HEARING (Basic Refractories, Inc.). U. S. 2,339,233, Jan. 11, 1944 (Aug. 3, 1940).—A process of making refractory shapes which comprises mixing 5 to 10% of approximately a 22° Bé. solution of calcium chloride with finely divided fired periclase-containing clinker, forming the material into shapes, and subjecting the shapes to a temperature in the range of 150° to 300°C. for several hours.

**Treating vessels having refractory linings.** FRANK ROBERSON. U. S. 2,339,192, Jan. 11, 1944 (June 27, 1941).—The method of treating blast furnaces lined with a refractory containing ferric oxide, the blast furnaces containing carbon monoxide in an amount sufficient to substantially attack the refractory by reacting with the ferric oxide when the refractory is at temperatures of approximately 400° to 550°C., which includes forcing through the refractory portions from the exterior thereof a gaseous medium which is neutral to the refractory to prevent infiltration of carbon monoxide into the refractory portions which are at the temperature range of approximately 400° to 550°C.

**Vertical retorts for zinc smelting.** NATIONAL SMELTING CO., LTD. Brit. 557,663, Dec. 15, 1943 (Nov. 21, 1941).

## Whiteware

**Crystalline and glassy phases of steatite dielectrics.** HERBERT F. G. UELTZ. *Jour. Amer. Ceram. Soc.*, **27** [2] 33–39 (1944).—13 references, 1 figure. See *ibid.*, **26** [11] 389–92 (1943).

**Durability of on-glaze decoration: II.** E. SHARRATT AND M. FRANCIS. *Tech. Paper Brit. Pottery Research Assn.*, Sept., 1939; reprinted in *Trans. Brit. Ceram. Soc.*, **42** [9] 171–82 (1943).—The durability of earthenware on-glaze decorations prepared under different firing conditions was examined, using cold vinegar and hot washing soda solution for the tests and assuming that the degree of attack gives a measure of the durability of the decoration. Fifteen lithographs, each with three depths of color, and a band of liquid gold were applied to earthenware plates, which were fired in six different works in three different positions in the enamel kiln, corresponding to hard, medium, and easy fired lithos. The fired lithos were subjected to acid and alkali attack, and the extent of attack was assessed on an arbitrary scale. The results revealed considerable differences in the resistance of different colors to attack. The colors most readily attacked by acid were two out of three blues examined, one out of three reds, and both grays. The colors most readily attacked by alkali were one red, both greens, one of two grays, the black, and the orange. Attack by acid is inclined to be specific and attack by alkali general, indicating possibly that acid attacks the pigment and alkali attacks the flux. Harder firing, in general, increases acid resistance more than alkali resistance in the range of transfer colors tested. Similar methods of approach should enable manufacturers to get some idea of the wearing qualities, attack by abrasion excepted, of any proposed lithographic decoration. For Part I see *Ceram. Abs.*, **22** [5] 76 (1943). R.A.H.

**Electron microscope investigation of firing phenomena in talc and steatite.** H. KEDESDY. *Ber. Deut. Keram. Ges.*, **24** [6/7] 201–32 (1943).—There is considerable disagreement regarding the reactions occurring when talc or steatite is dehydrated by heating at high temperatures. K. proposed to elucidate this question with the aid of an electron microscope. He used a Manchurian talc and a steatite from Göpfresgrün, Germany. The chemical analyses of the two are as follows:

| | $SiO_2$ | $Al_2O_3$ | FeO | CaO | MgO | $CO_2$ | $H_2O$ |
|---|---|---|---|---|---|---|---|
| Manchurian talc | 59.02 | 0.44 | 0.84 | | 32.75 | 2.31 | 4.91 |
| German steatite | 61.98 | 0.98 | 1.07 | 0.3 | 30.72 | 0.5 | 4.76 |

The mineralogical composition was computed as follows:

| | Clay | Talc | Magnesite | $CaCO_3$ |
|---|---|---|---|---|
| Manchurian talc | 1.11 | 94.73 | 4.43 | |
| German steatite | 2.48 | 96.79 | 0.50 | 0.54 |

The size distribution of the two minerals from $> 150$ to $< 0.3\ \mu$ is given. For the electron microscope investigation the fraction less than 1 $\mu$ radius was taken, which in

the case of talc amounted to about 11.5% and in the case of steatite, approximately 34.0%. Ignition loss at various temperatures was determined on all fractions of both minerals. Dehydration in both minerals set in at 800°. At approximately 1400° clinoenstatite was formed. Between these two limits existed only the protoenstatite modification. The phases $M_1$ and $M_2$, reported by E. Thilo ("Chemical . . . ," *Ceram. Abs.*, **19** [1] 25 (1940)) to exist before the protoenstatite, were not found. In the finer grained steatite the dehydration and the appearance of the protoenstatite and clinoenstatite occurred approximately 50° sooner. At the highest temperature existing in a ceramic furnace, protoenstatite is predominant. Where other materials are present, they fuse at this temperature forming a glass that separates the individual crystals of protoenstatite, prevents their growth, and confines them to a microcrystalline state. The operation of an electron microscope is described. The importance of this instrument for investigating the behavior of ceramic materials is discussed. Fourteen references and many illustrations are included. M.Ho.

**Quantitative determination of the glassy phase in a ceramic body.** ARNOLD G. JOHNSON AND DONALD B. UNDERHILL. *Jour. Amer. Ceram. Soc.*, **27** [2] 40–41 (1944).—1 reference.

**Tile bathtub.** W. KAEMPFERT. *N. Y. Times* (Science News), p. E9 (Oct. 24, 1943).—Standard tile are cemented to a frame made of wire cement by a simple, quick, and inexpensive method in Sweden. M.V.C.

PATENTS

**Aluminous ceramic and method of making.** J. A. HEANY (Heany Industrial Ceramic Corp.). U. S. 2,339,264, Jan. 18, 1944 (Oct. 27, 1938).—A process of making vitreous-like aluminous ceramics which comprises dehydrating at a low red heat to retain the colloidal properties and then wet grinding a chemically purified alumina in the presence of water until it has been partly hydrated and until the particles thereof have a size less than 20 microns and ranging between about 12 and 20 microns for the unhydrated ground material and below about 12 microns for the ground hydrated material, removing the water, forming, and firing.

**Bleaching clay.** IRA WILLIAMS (Sgoda Corp.). U. S. 2,339,594, Jan. 18, 1944 (March 20, 1941).—The process which comprises bleaching a clay slip under acidic conditions by means of a water-soluble hydrosulfurous compound at temperatures between 50° and 100°C. and in a proportion of about 0.05 to 0.25% based on the clay.

**Bleaching clay.** IRA WILLIAMS AND NATHAN MILLMAN (Sgoda Corp.). U. S. 2,339,595, Jan. 18, 1944 (Aug. 5, 1941).—The process of bleaching clay which comprises adding to a clay slip a small proportion of a preformed water-soluble metal salt of hydrosulfurous acid and powdered zinc in an amount equal to at least 25% of the weight of the salt.

**Spark plug.** G. S. WEINERTH. U. S. 2,340,091, Jan. 25, 1944 (May 3, 1941).

## Equipment and Apparatus

**Development of materials of the $TiO_2$–$ZrO_2$ system used for making condensers.** E. ALBERS-SCHÖNBERG. *Ber. Deut. Keram. Ges.*, **24** [2] 53–59 (1943).—The author reviews the development of three mixes used for making electric condensers. They are $TiO_2$, $TiO_2$–$ZrO_2$, and $TiO_2$–$ZrO_2$ mixed with other ceramic materials. These mixes are known as Kerafar U, Kerafar W, and Kerafar X, respectively. The ranges of the dielectric constants, effect of temperature on the dielectric constants, dielectric loss factors at various frequencies, effect of temperature on the loss factor, the firing, and other properties are reviewed. The compositions of the Kerafar mixtures are not given. M.Ho.

**Drying ceramic products in regions of relatively low humidity.** I. I. PALEEV. *Ogneupory*, **1939**, No. 5, pp. 333–40; No. 6, pp. 399–404.—The process of drying products in regions of relatively low humidity is discussed. Experiments show that the distribution of moisture in the interior of the product depends little on the conditions of drying. This fact permits the development of generalizations for drying. On the basis of these generalizations, predictions can be made of the course of drying and the changes taking place when drying conditions vary. M.V.C.

**Electron microscope and its application to problems in ceramics.** W. EITEL. *Ber. Deut. Keram. Ges.*, **24** [2] 37–53 (1943).—After a short review of the development of the electron microscope, E. briefly discusses the working of this instrument. The recent improvements in the electron microscope permit its use in any laboratory without requiring specially trained workers. It is a valuable tool for investigating ceramic raw materials and fired products. Its magnification of 30,000× makes possible the examination of fractions which hitherto remained hidden. The nature of ceramic materials makes them a suitable object for the electron microscope. Commonly encountered in ceramic materials, Al, Si, Ca, Na, etc., have a medium absorption capacity and give good contrasting pictures. Heavy metals, e.g., Fe, Cr, Ti, Zn, etc., are easily recognizable because of their high absorption. The electron microscope is superior to X-ray diagrams because it requires a considerably smaller sample and takes approximately one second, whereas the production of an X-ray diagram may require several hours. The sizing of a sample to be examined in an electron microscope must be done very carefully. It is quite useless to examine particles above 1 $\mu$ diameter; fractions having a diameter of 5 to 100 m$\mu$ are most suitable. To gain a complete picture of a clay, it should also be examined in a polarizing microscope and subjected to other physical tests. It is the electron microscope, however, that gives a picture of the primary particle of ceramic material. It enables a sharp differentiation between closely related minerals. Kaolin appears as perfectly hexagonal crystals. Montmorillonite forms flaky aggregates. Halloysite, contrary to the results obtained roentgenographically, shows up not as a layered structure but rather as an elongated structure resembling serpentine minerals. A platelike structure is displayed by all micas, their alteration products, talcs, and steatite. The value of the electron microscope becomes apparent when investigating reactions of ceramic materials in the solid state. This is illustrated by dehydration reactions of talc and kaolin. Dehydration phenomena of minerals can be studied with the electron microscope either statically or dynamically. In the first case the sample is heated outside the microscope, cooled, precautions being taken to prevent rehydration, and then examined. By the second method the sample is heated within the microscope. Both methods have their advantages. Samples of steatite heated at temperatures below 700° in no way differed from unheated talc. The change set in abruptly when samples were heated at 800°. At this point dehydration set in. The crystals clouded, exfoliation began, and profound changes were noticeable. No new crystals appeared, but the talc crystals disintegrated. No amorphous $SiO_2$ and MgO were observed. E. does not feel justified, therefore, in speaking of a "metatalc." At 900° recrystallization sets in quite clearly. Protoenstatite is distinctly visible against a background of $SiO_2$. Cristobalite also appears along with protoenstatite. This situation persists up to 1200°. Then the proto-form transforms irreversibly into the clino-form. The entire structure becomes fine grained, and incipient fusion sets in. An analogous investigation of kaolin is much more complicated. Only samples of the highest purity should be used. Up to 500°, kaolin crystals do not change. Dehydration sets in at 550° to 600°. Between 600° and 800° there seems to exist a pseudomorphous state. The existence of metakaolin, however, remains open. At 900°, recrystallization sets in, and the appearance of mullite can be observed. At 1100°, the change to

mullite is completed, and lines of cristobalite appear. In the presence of even small traces of impurities sintering and fusion can be noticed. Reactions taking place in a ground Portland cement during calcination are discussed. 15 references and illustrations. M.Ho.

**General purpose laboratory autoclave.** A. R. GILSON AND T. W. BASKERVILLE. *Chem. & Ind.*, **62** [48] 450–52 (1943).—A survey of the literature on the subject of autoclaves and high pressure hydrogenation equipment suitable for laboratory use and a study of apparatus which is commercially available shows that, while considerable progress has been made during the past few years both in the design and construction of this type of equipment, there is still room and a need for further development if the many, varied, and ever-increasing high pressure reaction requirements of the average research laboratory are to be adequately met. The hydrogenation autoclave described has a totally enclosed agitator in the form of a plunger which is operated electromagnetically. For purposes of description, the apparatus can be considered in three parts: (*a*) the autoclave, consisting of the vessel, cover, agitator, valve, pressure gauge, and associated connections; (*b*) the heater; and (*c*) the solenoid and control equipment. A complete description of the autoclave and its accessories is given. The proper method of using the equipment in the laboratory is outlined. R.H.B.

**Maintenance of electric furnaces.** Condensed from a booklet, "How to Maintain Electric Furnaces," published by the General Electric Co. *Chem. Industries*, **53** [5] 726 (1943).—A preventive Maintenance Inspection Schedule is given showing how often to inspect various parts, what parts to inspect, and what to inspect them for. The spare parts recommended by the manufacturer should be carried in stock. E.D.M.

**Metallizing.** NORMAN CLARKE JONES. *Chem. & Ind.*, **62** [51] 481–82 (1943).—A considerable saving in time, labor, and materials is being effected by spraying molten metal onto worn machine parts, surfaces exposed to corrosive action, and castings which would otherwise be rejected. The operation is simple, but the surface to be treated must be clean and dry and sufficiently rough to establish a bond with the hot sprayed metal which forms a tough smooth coating. Any metal in the form of a wire can be used, but spraying speed depends upon the size of the wire. The details of the spraying operation are discussed, including the gun and the surface characteristics of the metal film. Metals can be sprayed onto wood, cloth, and glass to any desired thickness. See "Repair...," *Ceram. Abs.*, **22** [11] 198 (1943). R.H.B.

**Safe-ending hand tools.** ANON. *Safety Eng.*, **83** [3] 33–34 (1942).—Hammer-struck tools may be made safe for use by cutting the struck end down to sound metal or rebuilding with a suitable weld metal. The reconditioning of tools by means of bronze welding is fully described. Tools struck by lightweight (one-hand) hammers receive one treatment, and those struck by heavy hammers or mauls receive another. 1 diagram, 6 photographs. M.R.

**Selection of lead wires for base-metal thermocouples.** PHILIP DAVIDSON. *Combustion*, **14** [10] 42–43 (1943).—In view of the present difficulty in procuring the usual lead wires for thermocouples, substitute materials often become necessary. The relationships of these various materials and combinations are discussed, and certain adjustments are indicated. H.E.S.

PATENTS

**Grading or separation of particles of solids, liquids, or gases.** NATHAN MUTCH. U. S. 2,338,779, Jan. 11, 1944 (Jan. 24, 1940).—Apparatus for grading particles dispersed in a fluid medium comprising a vaned wheel having passages between the vanes for the dispersion to be graded, a casing surrounding the vaned wheel and having tangential passages to feed the dispersion, the walls of the passages closely approaching the periphery of the wheel at separated points around the periphery, and means for drawing off separated particles at the places where the walls of the passages approach the periphery of the wheel.

**Method and device for measuring the thickness of light-transmitting layers.** HARALD STRAUB (vested in the Alien Property Custodian). U. S. 2,338,981, Jan. 11, 1944 (Aug. 26, 1940).

**Plasticity control for brick machines.** A. F. C. LOTZ AND F. C. MAHONEY. U. S. 2,340,673, Feb. 1, 1944 (May 4, 1942).—In an apparatus for extruding plastic clay bodies composed of clay and water, means for blending the clay and water to produce a plastic extrudable clay mixture, means for extruding the mixture to produce a moving column of plastic clay, means for constantly supplying clay, variable means for supplying water for admixture with the clay, and means responsive to variations in the speed of the extruded clay column to regulate the means supplying the water, whereby the speed of the extruded column of clay is maintained substantially at a predetermined value.

**Spectrophotometer.** E. D. COLEMAN. U. S. 2,339,053, Jan. 11, 1944 (Aug. 1, 1940).

**Thermocouple structure.** W. A. RAY. U. S. 2,339,809, Jan. 25, 1944 (March 17, 1941).

**Viscosimeter.** P. E. BJORK (Brown Instrument Co.). U. S. 2,340,507, Feb. 1, 1944 (Dec. 2, 1941).

## Kilns, Furnaces, Fuels, and Combustion

**Determining factors in selection of electric-furnace types.** VICTOR PASCHKIS. *Ind. Heating*, **11** [1] 52–60 (1944).—This paper is based upon characteristic sections of a book on calculation, design, and operation of electric furnaces soon to be published. P. discusses the types of furnaces and the field of application most suitable for each type, which are summarized in the accompanying table (see opposite page). M.Ha.

**Fuel problems in Brazil and Argentina.** J. B. CRANE. *Combustion*, **15** [1] 28–29 (1943).—C. gives first-hand observations on the fuel situation in Brazil and Argentina. With imports of coal and oil practically cut off by the war, Argentina has turned to the burning of wood, grain, and other vegetable products, and gas generated from charcoal has largely displaced gasoline in Brazil. H.E.S.

**Government forewarns on fuel deliveries.** ANON. *Combustion*, **15** [1] 40–41 (1943).—This survey of the fuel situation, compiled from various government sources, explains why it is imperative that consumers stock as much coal as possible during the summer months; it forecasts the increased demand during the next heating season and shows why a relaxation of present oil restrictions cannot be expected. Wide-scale conversions will continue to be necessary and should be initiated while there is still opportunity to secure deliveries of equipment and coal for storage. H.E.S.

**Nomogram relating basic characteristics of circular (Hoffmann) kilns.** M. I. ROGOVOĬ. *Ogneupory*, **1940**, No. 7, pp. 366–69.—Relationships found in the exploitation of Hoffmann kilns used in the production of building brick are discussed. These relationships are presented in the form of a nomogram with a logarithm scale and examples. M.V.C.

SEPARATE PUBLICATION

**Cooperative Investigation of the Effect of Furnace Type and Atmosphere on the Fusibility of Coal Ash.** H. M. COOPER AND R. F. ABERNETHY. *U. S. Bur. Mines Rept. Investigation*, No. 3724, 43 pp. Free.—Results are given of investigations on the fusibility of 9 coal-ash samples made in 16 laboratories that provided 23 different furnace-type and furnace-atmosphere combinations. R.A.H.

PATENT

**Furnace wall burner.** F. O. HESS AND JOSEPH EHLINGER (Selas Co.). U. S. 2,339,477, Jan. 18, 1944 (Jan. 9, 1941).

| | | Resistor furnaces | | | | |
|---|---|---|---|---|---|---|
| | | Directly heated | | | | |
| | | Induction | | Electrode | | |
| | Arc furnaces | High frequency | Low frequency | High frequency capacitance | Low frequency | Indirectly heated |
| Temperature limit | 6600°F. | Limited only by refractoriness of lining | | | | 2700°F. |
| Competitive heating methods | | | | | | |
| Melting | x | x | x | | x | |
| Heat-treating of metals | | x | (x) | | | x |
| Heat-treating of nonconductors | | | | x | | x |
| Advantages | | | | | | |
| Melting | Heated slag gives freedom in selection of slag. Freedom in selection of furnace lining material | High melting speed. Stirring action of slag and metal by electromagnetic forces | | | | |
| Heat-treatment of metals | | Rapid heating of a thin layer | | | | High thermal efficiency. Furnace independent of shape of piece |
| Heat-treatment of nonconductors | | | | Heat generated within the body | | Independent of shape. Great flexibility |

(See "Determining. . .," p. 56.)

M. HA.

## Geology

**Aluminum production in Arkansas.** ANON. *Mfrs. Record*, **111** [10] 32–33, 56, 64 (1942).—Arkansas occupies the unique position of being the only one of the United States in which all three processes for the production of aluminum (mining of bauxite, ore purification, and reduction) are carried out. These processes are described. 3 photographs. M.R.

**Base exchange capacity determination by means of a rapid colorimetric copper method.** DALE H. SIELING. *Jour. Amer. Soc. Agron.*, **33** [1] 24–36 (1941).—Previous base exchange capacity determinations have been laborious and time consuming. The method developed by S. is based on the sorption of copper from a standard cupric acetate-acetic acid solution by a definite quantity of soil. The exchange capacity is found by measuring the decrease in copper concentration produced in a measured volume of cupric acetate-acetic acid reagent by a weighed quantity of sample. Visual comparison of the unknown solutions with the standards is made in a simple and convenient combination filter rack and color comparator. W.R.B.

**Base unsaturation-pH relationship for various clays.** ADOLPH MEHLICH. *Soil Sci. Soc. Amer., Proc.*, **6**, 150–56 (1941).—Curves of pH vs. base unsaturation are shown for indianite, kaolinite, halloysite, beidellite, illite, and montmorillonite. By comparing these curves with similar curves for any soil or raw clay, it is possible to ascertain the presence of the kind of base-exchange mineral which is predominant in the specimen. W.R.B.

**Bauxite and alumina output soars as war-plane production increases.** W. E. TRAUFFER. *Pit & Quarry*, **36** [7] 115–22, 140 (1944).—T. describes the prospecting of deposits, bauxite mining, and alumina and aluminum manufacture as performed by the Aluminum Co. of America and its subsidiaries and affiliates. 24 photographs. M.R.

**Biological reduction method for removing free iron oxides from soils and colloidal clays.** L. E. ALLISON AND G. D. SCARSETH. *Jour. Amer. Soc. Agron.*, **34** [7] 616–23 (1942).—The authors have devised a biological method employing the principle of microbial reduction of iron oxide to remove it in a soluble form. Its effectiveness is compared with that of the chemical method described by Truog *et al.* W.R.B.

**Boron fixation.** R. Q. PARKS AND B. T. SHAW. *Soil Sci. Soc. Amer., Proc.*, **6**, 219–23 (1941).—Solutions of salts of silicon, aluminum, iron, calcium, magnesium, and phosphorus and suspensions of electrodialyzed humus and bentonite were mixed (alone and in various combinations) with boric acid and titrated to reactions varying from pH 5.0 to pH 9.0. Spectrographic analyses showed appreciable quantities of total and hot-water-insoluble boron in many of the resulting precipitates. A synthetic calcium aluminosilicate and a calcium-saturated bentonite were the only two systems studied in which the total boron content of the pH 8.0 precipitates was in a form insoluble in boiling distilled water. W.R.B.

**Determination of small amounts of exchangeable potassium.** N. J. VOLK. *Jour. Amer. Soc. Agron.*, **33** [8] 684–89 (1941).—The sodium cobaltinitrite procedure was employed in determining very small amounts of potassium in soils. The method is sensitive to a concentration of potassium as low as 0.0005%. The sample is first leached with ammonium acetate to displace potassium. This, after being freed of ammonia and organic matter, is taken up in 0.16 *N* acetic acid and precipitated as potassium sodium cobaltinitrite. Complete precipitation is obtained by rapidly adding the solution containing the potassium to an equal volume of 20% sodium cobaltinitrite containing an additional 4% of sodium as the acetate. Mixing is done at room temperature, and precipitation is allowed to go to completion at about 3°C. The amount of potassium is finally determined by dissolving the washed precipitate in water and titrating with permanganate. W.R.B.

**Electrical resistance method for making continuous measurement of moisture in large bodies of soil, clay, or cement.** ANON. *Jour. Amer. Soc. Agron.*, **32** [12] 1140–41 (1940).—A method is described for making continuous measurements of moisture in soils and in concrete from the saturation point down to the air-dry condition. The method makes use of plaster of Paris block, in which are imbedded two electrodes, and a special form of Wheatstone bridge. The principle of the method is based on the following facts: (1) Plaster of Paris maintains close moisture equilibrium with its environment. (2) The electrical resistance of the plaster of Paris block is inversely propor-

tional to its water content. (3) Plaster of Paris is soluble enough to act as a buffer and minimize the influence of salts. From tests made, the method is satisfactory for moisture measurement under all field conditions. W.R.B.

**Influence of calcium carbonate content and exchangeable sodium-calcium ratio on physical properties of clays.** J. R. McHenry and H. F. Rhoades. *Soil Sci. Soc. Amer., Proc.*, **7**, 42–47 (1942).—A study was made to determine the effects of changing the ratio of exchangeable sodium to calcium and the result of varying the calcium carbonate content on lower plastic limit, plasticity index, scouring point, residual shrinkage, moisture equivalent, and hygroscopic equivalent. Lower plastic limits were not significantly affected. An increase in replacement of the calcium ion by sodium ion gave a significant increase in the residual shrinkage value, as did the addition of calcium carbonate. W.R.B.

**Lower Mississippi Valley loess.** R. J. Russell. *Bull. Geol. Soc. Amer.*, **55** [1] 1–40 (1944).—Loess is redefined as unstratified, homogeneous, porous, calcareous silt, of which at least 50% by weight must be within the grain-size fraction 0.01 to 0.05 mm. It is generally yellowish to buff, splits along vertical joints, maintains steep faces, and contains concretions and snail shells. The author believes that the lower Mississippi Valley loess is not of eolian origin, as has been commonly held for a long time, or of lacustrine, fluvial, or other direct sedimentary origin. Upslope parent terrace deposits, similar to Recent backswamp clays, have weathered into brown loam that has crept downslope to accumulate in greatest thicknesses as bluff mantles and in valleys. The general process is here termed "loessification." R. suggests that true loess in other regions had a similar origin. A.C.B.

**Manganese deposits near Walnut Grove, Alabama.** Anon. *Mfrs. Record*, **112** [5] 48 (1943).—Manganese deposits in the Murphree Valley near Walnut Grove, Etowah and Blount Counties, Ala., have been examined and mapped by the U. S. Geological Survey. The deposits of the area are associated with the Fort Payne chert, of the Mississippian Age, on the northwest limb of the Murphree Valley anticline. The ore consists mainly of soft pulverulent pyrolusite in chert and clay that are residual from the weathering of the Fort Payne chert. M.R.

**Mineral composition of a micaceous clay from Sárospatak, Hungary.** W. Daubner. *Ber. Deut. Keram. Ges.*, **24** [2] 59–67 (1943).—A sample of the micaceous clay dried at 200° was submitted to a complete chemical analysis. Simultaneously, the exchangeable bases and $H_2O$ loss at 20° to 200°, 200° to 410°, 410° to 460°, and 460° to 1200° were determined. From the results of these analyses D. calculated the rational composition as follows: clay minerals 33.17 (kaolinite 9.38 and montmorillonite 23.79%), muscovite 49.90, orthoclase 9.03, serpentine (?) 3.09, free $SiO_2$ 3.27, and others 1.54%. The last item is made up of mica constituents ($TiO_2$ 0.12, $H_2O$ 0.21, and FeO 0.15%) and exchangeable bases ($K_2O$ 0.30, CaO 0.62, and MgO 0.14%). On this basis D. calls this material a quartz-poor mineral consisting of up to one-half muscovite and containing montmorillonite and feldspar. D.'s rational composition does not agree with the results of X-ray analyses. This he attributes to the fact that crystallographically mica closely resembles montmorillonite. When the latter is heated to 500° it has the same stoichiometric composition as pyrophyllite, $H_2O \cdot Al_2O_3 \cdot 4SiO_2$. In analyzing roentgenographically a material containing montmorillonite and muscovite, the sample may well appear as an alkali-poor micaceous substance. In such case only a complete chemical analysis taken together with a determination of exchangeable bases and loss of $H_2O$ at various temperatures gives the correct answer. The details and procedure of the analyses are given. M.Ho.

**Mineral production in 1942 breaks all records.** Anon. *Mfrs. Record*, **112** [1] 20–21, 56 (1943).—The South, together with the rest of the U. S., produced more metals and minerals in 1942 than at any time in its history. The South normally produces 100% of all of the Nation's bauxite, nearly 100% of its sulfur, more than 95% of its ball clay, and nearly 90% of its kaolin. Southern production of other minerals ranges down to 35%. It is estimated that the South produced $3,153,000,000 worth of minerals in 1942, while the output of the entire U. S. was $7,525,000,000. There was an increase during 1942 of 11% in the production of clay in the South. This was due largely to increased fire-clay sales. 2 photographs. M.R.

**Nomograms for rapid calculation of density, water content, and total porosity relationships.** G. B. Bodman. *Jour. Amer. Soc. Agron.*, **34** [10] 883–93 (1942).—Some well-known equations from elementary soil physics are reviewed in the light of the major assumptions which they contain. From them, certain widely used relationships are developed in forms suitable for the preparation of alignment charts which express the relations concerned. Two nomograms are shown relating water content, apparent density, real density, and total pore space. W.R.B.

**Phosphate penetration into kaolinite crystal.** C. A. Black. *Soil Sci. Soc. Amer., Proc.*, **6**, 157–61 (1941).—Experiments are described and interpreted to show that phosphate ions may not only replace hydroxyl ions on the surface of kaolinite particles but do also penetrate between the lattice layers. This phosphate may be extracted with suitable agents. B. believes that most or all of the phosphate fixed by the clay has merely replaced hydroxyl ions. There is a possibility of some aluminum phosphate precipitation between the lattice layers. W.R.B.

**Phosphorus adsorption by soils as influenced by reaction, base saturation, and free sesquioxides.** W. V. Chandler. *Jour. Amer. Soc. Agron.*, **33** [1] 1–12 (1941).—Considerable evidence is presented to show that various agencies were active in the adsorptive processes. It appears that the adsorption within the pH range of most acid soils or clays was due primarily to the formation of insoluble iron and aluminum phosphates, and adsorption in the range of neutral to alkaline soils containing considerable available calcium was due to the precipitation of tricalcium phosphate. W.R.B.

**Phosphorus fixation as affected by temperature.** R. R. Robinson. *Jour. Amer. Soc. Agron.*, **34** [4] 301–306 (1942).—R. shows that phosphate fixation in soils kept at 15° to 45°C. is much greater than that in soils incubated at 3°C. W.R.B.

**Phosphorus fixation in relation to iron and aluminum.** W. H. Metzger. *Jour. Amer. Soc. Agron.*, **33** [12] 1093–99 (1941).—M. discusses experimental evidence leading to the conclusion that the phosphorus-fixing capacity under field conditions of acid soils can be largely accounted for by precipitation phenomena, while fixation at particle surfaces in a replaceable form is of slight practical significance. W.R.B.

**Rapid method of determining the total carbon content of clays using perchloric acid.** M. J. Plice and Jesse Lunin. *Jour. Amer. Soc. Agron.*, **33** [9] 851–55 (1941).—A well-defined method is given for determining total carbon. Results compare favorably with those produced by the gas or electric combustion furnace. Determinations can be completed in approximately half the time required by the combustion-furnace method. W.R.B.

**Springvale bauxite district, Georgia.** Anon. *Mfrs. Record*, **112** [5] 42 (1943).—A guide to prospecting for additional reserves of bauxite in the Springvale mining district, Randolph County, southwestern Ga., is now available through the U. S. Bureau of Mines. No bauxite mining has been done in the district since 1920, but preliminary surveys show that many small- to medium-sized deposits exist there. M.R.

**Studies of clay particles with the electron microscope: III, Hydrodynamic considerations in relation to shape of particles.** O. J. Kelley and B. T. Shaw. *Soil Sci. Soc. Amer., Proc.*, **7**, 58–68 (1942).—By the use of the hydrodynamic theory and by using the electron microscope to determine two dimensions, it becomes possible to calculate the third and thus determine the specific surface of clay particles. Specific areas were thus calculated for dickite.

kaolin, quartz, bentonite, and halloysite. Calculations are given for various fractions of the materials studied. W.R.B.

**Symposium on testing and classification of ball clays: II, Condensed report of Symposium II.** RALSTON RUSSELL, JR., AND ARTHUR S. WATTS. *Bull. Amer. Ceram. Soc.*, **23** [2] 47–53 (1944).—3 references. **Open letter to Chairman of White Wares Division Committee on Research.** SIDNEY SPEIL. *Ibid.*, pp. 56–57.

**Vermiculite as a raw material in ceramic manufacture.** F. K. PENCE AND E. B. BLOUNT. *Jour. Amer. Ceram. Soc.*, **27** [2] 50–52 (1944).—3 references.

SEPARATE PUBLICATIONS

**Process for Extracting Alumina from Kansas Clay.** E. D. KINNEY. *State Geol. Survey Kansas Bull.*, No. 47 (Part 4), pp. 113–36 (Dec., 1943).—A process for the extraction of alumina from clay, utilizing Kansas raw materials, is described. This process is essentially the old soda-sinter process with a new method, devised in the laboratories of the State Geological Survey of Kansas, for controlling the impurities in the solution from which the aluminum hydroxide is precipitated. This method consists of the fractional precipitation of impurities by carbon dioxide gas and their removal by filtering. The method may make it possible for Kansas raw materials to compete commercially with other sources of alumina. For a better understanding of the subject, a review of the metallurgy of aluminum is given.

**Strategic Mica.** G. RICHARDS GWINN. *U. S. Bur. Mines Information Circ.*, No. 7258, 21 pp. Free.—G. gives information on block mica of value to mica miners, such as an outline of the Government mica program, specifications, information on preparation for market, prices, and priorities. Lists of State coordinators of mines, lists of buyers and grinders of nonstrategic mica, publications on mica, and a glossary of terms used in the paper are included. R.A.H.

PATENT

**Method and means for treating vermiculite, etc.** W. KENYON & SONS, LTD., AND B. B. SLOR. Brit. 558,015, Dec. 30, 1943 (June 13, 1942).

## Chemistry and Physics

**Determination of density by the flotation method.** T. C. VAUGHAN. *Bull. Amer. Ceram. Soc.*, **23** [2] 68–69 (1944).—2 references.

**New rapid method for estimating the alumina content of refractory clays and chamotte.** A. DIETZEL. *Ber. Deut. Keram. Ges.*, **24** [8/9] 283–86 (1943).—This new method is based on the determination of the refractive index of a bead made from the sample by fusion and a comparison of the result with a standard curve. The underlying principle is that vitrified $SiO_2$ has a refractive index of 1.46. The refractive index of $Al_2O_3$ depends on the coordination number of Al. The average determined experimentally can be taken as 1.62; thus, a curve drawn for 0 to 100% $Al_2O_3$ will be limited by the values 1.46 to 1.62. A variation of 1% in the $Al_2O_3$ content shifts the value of $n_D$ by 0.0016. The refractive index can be determined with an accuracy of 0.002 within a few minutes. It follows that the $Al_2O_3$ content can be calculated within 1% in approximately the same time. Fire clays usually contain oxidic admixtures, notably $TiO_2$. These may affect the value of the refractive index. To eliminate this error, standard curves were worked out using standard samples. These curves, giving $n_D$ vs. $Al_2O_3 + TiO_2$, were worked out for raw clay and for fired clay. The curves are expressed mathematically by $\%Al_2O_3 + TiO_2$ in raw clay $= 500 \times n_D - 732$ and $\%Al_2O_3 + TiO_2$ in fired clay $= 654 \times n_D - 963$. The procedure for determining $n_D$ is as follows: place approximately half a teaspoonful of the material to be tested (properly ground) on a refractory base. Using a carbon arc, fuse the sample to one or several glassy beads. Samples with up to 40% $Al_2O_3$ may be cooled in air without inducing crystallization. Samples with a higher $Al_2O_3$ content should be rapidly quenched. This is conveniently done either by touching the still molten mass with, e.g., a copper soldering iron or by dropping the beads into water. Wipe the beads clean of adhering impurities, grind the cleaned beads in a steel mortar, and determine the $n_D$ of the powdered material in a microscope. A series of immersion liquids should be kept on hand. The liquids should vary by increments of 0.005. For the preparation of these liquids, D. recommends the following oils: rapeseed oil $n_D$ 1.47, santal oil $n_D$ 1.51, clove oil $n_D$ 1.54, and cinnamon oil $n_D$ 1.60. The prepared liquids are checked in a refractometer. M.Ho.

**Report on the systems lead oxide–alumina and lead oxide–alumina–silica.** R. F. GELLER AND E. N. BUNTING. *Jour. Research Nat. Bur. Standards*, **31** [5] 255–70 (1943); RP 1564. Price 10¢.—A report is given on the phase relations in the systems $PbO–Al_2O_3$ and $PbO–Al_2O_3–SiO_2$. It is reasonably certain that the compound $PbO \cdot Al_2O_3$ exists, that it is unstable at temperatures in excess of about 970°C., that it breaks down to form corundum and glass, and that it forms a eutectic with PbO (at about 94% PbO) melting at 865°C. The fields of corundum and of mullite appear to dominate the ternary diagram, with the silica field as a narrow strip extending along the $PbO–SiO_2$ side of the diagram. Three ternary compounds and 10 quintuple points, which include 6 eutectics, were found in compositions containing over 70% PbO. The compound $8PbO \cdot Al_2O_3 \cdot 4SiO_2$ melts incongruently at 837°C. to form a ternary compound of undetermined composition and liquid. This compound, in turn, may break down to form corundum and liquid. The third established ternary compound is $6PbO \cdot Al_2O_3 \cdot 6SiO_2$, which melts congruently at 811°C. The liquidus temperatures of the quintuple points range from 694° to 837°C. Three of the eutectics melt within 1° of 695°C. and within 0.2% of 1.2% $Al_2O_3$ in the composition; their PbO contents are 82.6, 89.8, and 93.1%, respectively. A considerable portion of the system remains to be investigated. The indications are that at least four more ternary compounds exist in addition to those identified. The melting point of $Al_2O_3$ was redetermined and found to be 2.035° ± 10°C. R.A.H.

**System $CaSiO_3–CaAl_2Si_2O_8–NaAlSiO_4$.** W. K. GUMMER. *Jour. Geol.*, **51** [8] 503–30 (1943).—Phase equilibria at high temperatures were investigated experimentally in the system. The results are presented in tables and equilibrium diagrams. On this basis, the courses of crystallization in typical mixtures of these compounds are discussed. Some information is afforded also on the development and interrelations in rocks of nepheline, plagioclase, melilite, and wollastonite. A.C.B.

SEPARATE PUBLICATIONS

**Data on Chemicals for Ceramic Use.** Compiled by ALEXANDER SILVERMAN, GEORGE W. MOREY, AND FREDERICK D. ROSSINI. *Bull. Nat. Research Council*, No. 107, 94 pp. (1943).—This collection of data is based on a Report of the Committee on Chemical Data for Ceramists, Division of Chemistry and Chemical Technology of the National Research Council. Elements and compounds are arranged alphabetically by names. The collection includes all available data to 1941 on density, melting point, transition point, boiling point, sublimation point, decomposition temperature, refractive index, crystal form, and color of chemical substances that are of interest to ceramists. C.W.

**Modern pH and Chlorine Control.** Published by W. A. Taylor & Co., 7300 York Road, Baltimore 4, Md. 6th ed. 83 pp. Free.—This completely revised combination handbook and catalog is of value to everyone interested in the control of pH (acidity and alkalinity), chlorine, phosphates in boiler water, and water analysis. Fifty pages are de-

voted to (1) a simple, nontechnical explanation of the meaning of pH control and the methods for making colorimetric determinations, (2) precautions to be observed, (3) discussion of the application of pH and chlorine control to 31 different fields, and (4) a technical discussion of the meaning of pH control, both colorimetric and electrometric. These four sections bring together, in condensed form, information which cannot be obtained elsewhere except by reference to innumerable textbooks and original articles. The remaining pages contain descriptions of Taylor slide comparators for general pH and chlorine control, for determination of phosphates in boiler water, and for general water analysis.

PATENTS

**Ceramic mix and method of preparing.** C. G. HARMAN. U. S. 2,338,717, Jan. 11, 1944 (Aug. 2, 1940).—A ceramic mix including as an essential ingredient approximately 0.5 to 2% of a gelatinized corn flour.

**Preparation of titanium dioxide.** I. E. MUSKAT AND ALPHONSE PECHUKAS (Pittsburgh Plate Glass Co.). U. S. 2,340,610, Feb. 1, 1944 (May 4, 1939).

## General

**Boiler design—factors that influence availability.** V. SMITH. *Elec. Rev.*, **133** [3442] 647–49 (1943).—S. discusses the efficiency of fuel-burning appliances, particularly pulverized-fuel firing and stoker firing. The first mentioned is the preferred method. He suggests that there is an important field for investigation into the results obtained with furnaces of different volumes and degrees of water cooling. Proper furnace design will consider the B.t.u. available per square foot of heating surface rather than the B.t.u. per cubic foot of furnace volume. 1 diagram. M.R.

**Bonded deposits—causes and possible remedies.** ANON. *Elec. Rev.*, **133** [3442] 641–42 (1943).—The bonded deposits on the heating surfaces of boilers may be due to inferior fuel and improper stoking. Such deposits are found only in stoker-fired plants. Remedies suggested are (1) that all future plants be pulverized-fuel fired when the geographic and other factors are favorable, (2) a lower boiler rating for superheated boilers, and (3) the spraying of milk of lime on the heating surfaces through dosing the soot-blowing steam of the soot blowers. M.R.

**Centrifugal dust collectors. Factors influencing the design: I–III.** H. L. MUNTGOMERY LARCOMBE. *Ind. Chemist*, **18** [214] 433–38; [215] 477–85 (1942); **19** [216] 25–28 (1943).—The most widely used method of separating air-borne dusts from air or other gases is the centrifugal method embodied in the ordinary cyclone dust collector. This type of unit possesses fundamental advantages of simplicity, low initial and operating costs, and, when correctly designed and installed, high collecting efficiency. A brief summary of factors influencing the design of cyclones is given, and its suitability for dust analysis is discussed. See "Dust. . .," *Ceram. Abs.*, **21** [11] 240 (1942). H.E.S.

**Collection and disposal of fly ash from spreader stokers.** K. H. BOWMAN. *Combustion*, **15** [3] 37–40 (1943).—B. discusses fly ash from spreader stokers and describes a helicoidal type of arrestor for installation in the base of the stack. Reinjection of the collected fly ash is discussed at length. H.E.S.

**Conservation in design of power stations.** F. H. HOLLISTER. *Combustion*, **14** [11] 43–46 (1943).—H. reviews steps already taken to conserve steel and copper in the design of recent power stations and electrical structures and offers suggestions on further savings should the war be of long duration. He predicts that many of these expedients will become future accepted practice. H.E.S.

**Conveyer belting.** J. SMELLIE. *Mech. Handling*, **30** [1] 14–19 (1943).—S. discusses the use of substitute materials and the salvage of old belting. Substitute belting materials include various fabric and steel belts. Belt wear and belting joints are described. Experienced men should be employed to examine and repair belts. 3 diagrams. M.R.

**Corrosion by hot gases.** RICHARD C. COREY. *Combustion*, **15** [5] 34–39 (1943).—C. reviews briefly the concepts of the mechanism of metallic corrosion at high temperatures and discusses the role of alloying elements added to iron, steel, and copper to confer high temperature corrosion resistance. Quantitative data on the rate of corrosion are presented. H.E.S.

**Corrosion by liquids.** R. C. COREY. *Combustion*, **15** [2] 35–39 (1943).—C. reviews and discusses the theory of corrosion, in the presence of moisture, of metals commonly employed in power-plant practice as considered from the thermal and electrochemical standpoints by numerous investigators. H.E.S.

**Discussion of "Behavior of glazing material subjected to explosion."** T. R. EILENBERG AND W. K. JONES. *ASTM Bull.*, No. 124, pp. 15–17 (Oct., 1943).—The difficulty of reproducing blast waves due to erratic deflections and reflections was partially overcome by the use of an explosive mixture of illuminating gas and air detonated by an automobile spark plug. The object of the test was to devise a means of protecting office personnel from flying glass caused by bomb explosions. Plywood panels hinged 6 in. away from the window proved effective in stopping the flying glass; ventilation is provided through the marginal space. Plywood placed close to the glass, Venetian blinds, and felt blankets fastened to window sash were ineffective. A thin plastic material fastened in a light wood frame was torn from the fastenings along two edges but was not blown from the frame. This type of material offers promise as a temporary glazing material. Wire screen and chain-link screen were tested; the latter is preferred. Quilted paper also proved to be satisfactory. **Closure.** F. W. ADAMS. *Ibid.*, p. 17.—The difference in the type of blast produced by the ignition of a gaseous mixture as compared with that produced by a high explosive is of no significance in studying methods of producing a barrier to stop flying glass but does become significant in testing the relative resistance of various glazing materials to explosive blasts. See *Ceram. Abs.*, **23** [1] 8 (1944). B.C.R.

**Dust collectors constructed of noncritical materials.** LOUIS C. WHITON. *Combustion*, **15** [6] 49–53 (1943).—The results of tests in which ceramic tubes were substituted for steel in the construction of internal parts of fly-ash collecting equipment are discussed. The adopted design is described. H.E.S.

**Dust is dynamite.** B. P. CALDWELL, JR. *Safety Eng.*, **84** [4] 46–50; [5] 13, 16; [6] 35–38 (1942).—Dust-explosion hazards exist in a wide range of industries. The Underwriters' Laboratories are continuing a study involving many phases of the problem. This study covers (1) the use of suction and blower systems for dust removal, (2) static generated by dust, (3) the theory of dust explosions, (4) chokes and seals used in the starch industry, (5) explosion proof electrical devices, (6) expanding bin walls to counteract damage to buildings, and (7) production of carbon monoxide in starch-factory explosions and the resulting high fatality rate. 5 photographs. M.R.

**For the rope headache.** ANON. *Safety Eng.*, **84** [4] 33–34, 36–37 (1942).—Ten suggestions for the conservation of rope are given: (1) know your loads, (2) start it right, (3) avoid kinks, (4) beware of chemicals, (5) knots are only one half as strong, (6) reversing ropes, (7) reduce wear and abrasion, (8) blocks and sheaves, (9) inspection, and (10) store it properly. 9 diagrams and 1 photograph. M.R.

**Gravity-bucket conveyers or pivoted-bucket carriers.** W. H. ATHERTON. *Mech. Handling*, **30** [1] 2–10; [2] 61–71; [3] 110–16; [4] 162–65 (1943).—A detailed description of many British and American gravity-bucket conveyers and pivoted-bucket carriers is given. All the parts making up the system are described, including chain, buckets or carriers, sprockets, feeding and loading devices, and trippers or unloaders. Many conveyer installations are discussed, including a single-strand conveyer (for use

in breweries and bottling works) equipped with cone-shaped carriers for holding bottles neck down. 37 diagrams and 8 photographs. M.R.

**How to design exhaust hoods: VII, Hoods for dust control: partial enclosures, miscellaneous.** J. M. DALLA VALLE. *Heating & Ventilating*, **40** [9] 79–82 (1943).—The discussion covers hoods for use in granite cutting, asbestos carding, etc. Hoods for conveyer belts are included. **IX, Booth-like structures for fumes, vapors, and gases.** *Ibid.*, [11] 80–83.—The effective ventilation of spray painting booths or hoods is discussed. This offers many difficulties, most important of which are (1) inability of the operator to control the air flow and (2) removal of any spray paint which escapes and clogs the exhaust system. The velocity distribution at the booth opening and designs of stationary and conveyer (or mechanically operated) spray booths are treated. **X, Grille-type openings under suction.** *Ibid.*, [12] 67–68.—Grille-type openings act as combined local and general exhaust and find their greatest application in operations where the production of dust or fume is caused by movable objects, such as foundry castings. This type of opening is usually employed with exhaust hoppers. Foundry shake-out exhausts, exhausts used for welding, and exhaust tables are described. Diagrams and tables. **XI, Hood-entrance losses.** *Ibid.*, **41** [1] 61, 100 (1944).—The author discusses the estimation and calculation of hood-entrance losses of four types of hoods. Coefficients and other data are given in one diagram and four tables. For Parts **I–III** see *Ceram. Abs.*, **23** [1] 29 (1944). M.R.

**Industrial planning of ceramic plants.** ERICH MAZUREK. *Ber. Deut. Keram. Ges.*, **24** [8/9] 287–93 (1943).—M. discusses in detail the planning of the layout, construction, building materials, etc., for ceramic plants. M.Ho.

**Let's try manila.** S. A. REED. *Safety Eng.*, **82** [4] 28, 30–31. (1941).—R. suggests that only first-grade rope be purchased because industry uses it for many purposes and therefore cannot risk using lower grades. He then discusses the use of rope, the making of slings and their use, and the care and treatment of rope. 4 photographs. M.R.

**Metallic dusts tested by Bureau of Mines.** ANON. *Heating & Ventilating*, **41** [1] 60 (1944).—To safeguard the lives of war workers, the U. S. Bureau of Mines has ascertained the inflammable characteristics of many of the metallic dusts found in war plants. Zirconium was found to be particularly dangerous, igniting spontaneously at room temperature. Other dusts tested included aluminum, antimony, cadmium, chromium, copper, iron, lead, magnesium, tin, and zinc. M.R.

**Modern steam-generating equipment.** M. H. KUHNER. *Nat. Engr.*, **45** [4] 240–45 (1941).—K. discusses steam-generating equipment, including high-pressure boilers, blow-off valves, and steel casings for boiler settings. Superheaters, heat-recovery equipment, furnace designs, and fuel-burning equipment are not discussed. Some of the basic design requirements of modern high-pressure boilers covered are natural circulation, steam release in modern boilers, working water level, blowdown valves and their capacities, thermal expansion and suspension of boilers, and boiler settings. Photographs and diagrams. M.R.

**Operation of hot-process softener at 50-lb. gauge improves performance and saves chemicals.** C. E. JOOS AND FRANK KEMMER. *Combustion*, **14** [10] 45–47 (1943).—This installation, with a capacity of 28,000 gal. per hr., is designed for 50-lb. gauge pressure and 298°F. and is believed to be the first and only hot-process softener in service operating under such high pressure and temperature conditions. Saving in both lime and soda ash is thereby effected. The treatment is controlled from analysis of the raw water. H.E.S.

**Overfire air jets effective for smoke elimination.** ANON. *Nat. Engr.*, **47** [11] 702 (1943).—A study for Bituminous Coal Research has been made by the Battelle Memorial Institute. Jets of air directed over beds of burning coal provide the turbulence necessary to complete the combustion of hydrocarbons that usually leave the bed unconsumed. The study included designs of air jets that would be suitable for hand- and stoker-fired furnaces. Steam pressures varied from 48 to 170 lb. per sq. in. The jet consists of an open length of tubing passing through the furnace wall with a steam nozzle directed axially into the outer end. The most favorable length of air tube was found to be 7.5 times the diameter. The jet should have a simple silencer. A tube 15 in. long and 2 in. in diameter with a jet $^1/_8$ in. in diameter will deliver 1026 lb. of air per hr. with the use of 72.7 lb. of steam at 100 lb. per sq. in. gauge pressure. M.R.

**Prevent dermatoses.** J. A. GOLDBERG. *Safety Eng.*, **83** [4] 43–44 (1942).—Occupational dermatoses can be prevented by (1) enclosing processes wherever possible so that workers will not come in contact with offending materials; (2) providing adequate ventilation so that irritating dusts and fumes may be drawn off without coming in contact with the workers; (3) the use of ointment and other devices to maintain personal protection; and (4) developing plant and individual cleanliness by keeping workrooms scrupulously clean, providing clean work clothes, clean locker rooms, shower baths, etc. 3 photographs. M.R.

**Prolonging the life of wire ropes.** E. INGHAM. *Mech. Handling*, **30** [1] 11–13 (1943).—Several means whereby the working life of a wire rope may be considerably lengthened are outlined. The rope should be kept from any overstress, guarded against rusting and corrosion, carefully lubricated with suitable lubricants, and periodically inspected. M.R.

**Safety precautions—the importance of skilled maintenance.** H. GREAVES. *Elec. Rev.*, **133** [3441] 603–604 (1943).—Many portable electric tools and appliances are being used in the office as well as in the shop, and precautions against shock to operators must be taken. Wherever possible, push buttons should be made of insulating material. Portable equipment should receive at least a monthly examination, and particular attention should be paid to grounding. Maintenance work should be well organized and done by competent mechanics and not by "handy men." M.R.

**Storage of raw materials in refractory plants. Decisive factor in production.** V. I. PEREVALOV AND S. M. ALMAZOV. *Ogneupory*, **1940,** No. 5–6, pp. 312–19.—Suggestions are given to minimize the great waste taking place during the storage of raw materials. M.V.C.

**Ray Thomas Stull.** ANON. *Bull. Amer. Ceram. Soc.*, **23** [2] 41–43 (1944).—1 photo.

**Task of ceramic-machine building in the present time.** W. SCHLEGEL. *Ber. Deut. Keram. Ges.*, **24** [8/9] 293–97 (1943).—Along with modern automatic or semiautomatic machines, considerable manual labor is still used in the ceramic industry. S. attributes this backwardness not so much to lack of suitable machinery as to the desire not to reveal trade secrets. Actually, industrial secretiveness and the unwillingness to share experience hamper progress. In the postwar Europe organized by victorious Germany there will be no need and no place for industrial reticence. Complete sharing of industrial experience within the respective industrial fields will be imperative in order to organize a progressive and efficient ceramic industry able to compete successfully with the U.S.A. M.Ho.

**Wartime maintenance of electric control equipment.** E. H. ALEXANDER. *Heating, Piping & Air Conditioning*, **14** [10] 597–99 (1942).—Any equipment which is used more or less continuously should be inspected regularly and repaired as soon as the need for such repair is discovered. Grease, water, dirt, and oil should be prevented from accumulating in or on operating parts of control equipment. Heaters might have to be installed to keep them in a dry state or it might be necessary to coat them with a protective paint or varnish several times a year. Clearances and free working of parts should be checked at intervals. A. describes and offers remedies for troubles found in coils, resistors, and relays of several types. He concludes with suggestions for safeguarding equipment situated in plants whose manufacturing processes produce corrosive fumes. M.R.

**Wire snakes.** F. L. SPANGLER. *Safety Eng.*, **83** [5] 13

(1942).—S. compares a worn wire rope with a rattlesnake and urges that caution be used when handling wire rope. Unless proper care is taken, hands may be punctured or lacerated by "jaggers" on the rope or by the sharp wires at the rope ends. The most popular preventive measure is careful rope inspection, followed by the use of preformed rope. Nine other measures are listed. 1 photograph.
M.R.

**Worse than a buzz saw.** F. L. SPANGLER. *Safety Eng.*, **82** [4] 46, 48 (1941).—S. discusses the injuries caused by contact with wire rope. Remedies suggested, in answer to a questionnaire submitted to qualified Federal agencies, are (1) the use of preformed wire rope, (2) daily inspection and replacement of damaged or worn rope, and (3) greater care in the use and maintenance of rope. 2 photographs.
M.R.

SEPARATE PUBLICATIONS

**Fires in Surface Mining and Milling Structures.** D. HARRINGTON AND J. H. EAST, JR. *U. S. Bur. Mines Information Circ.*, No. 7250, 9 pp. Free.—Fire hazards in surface mining and milling structures are discussed, and the importance of taking every precaution to guard against fire loss is shown. Ten reasons for fires in such structures are given.
R.A.H.

**Wage Incentives in Wartime.** Published by Consolidated Management Consultants, New York, N. Y., 1943. 48 pp. Free to manufacturers and executives.—This booklet covers all aspects of the wage-incentive problem, constituting a manual for the application of this government-approved output booster. The major phases of wage incentives treated include the selection of a suitable plan, methods of obtaining WLB approval, the installation of the plant, and keeping it in scientific operation.

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# THE BULLETIN SECTION

Volume 23 March 15, 1944 Number 3

## WAR CONFERENCE GENERAL SESSION

**Hotel William Penn: Ball Room**

**Monday Forenoon, April 3, 1944: 10:00 A.M.–12:00 M.**

**Presiding Chairman: Cecil Eugene Bales, President, The American Ceramic Society, Inc.**

**10:00–10:30 A.M.**

**1. Be Vigilant**

By Major Albert J. Stowe: Military Intelligence, Office of Civilian Defense, Washington 25, D. C.

**10:30–11:00 A.M.**

**2. Wage Incentives**

By James Finney Lincoln: Lincoln Electric Company, 12818 Coit Road, Cleveland 1, Ohio

**11:00–11:30 A.M.**

**3. Postwar Housing Relationship to Industry**

By I. W. Clark: Westinghouse Better Homes Department, Pittsburgh 30, Pa.

**11:30 A.M.–12:00 M.**

**4. Porcelain Enamel in Postwar Enamel Industry**

By Robert A. Weaver: Ferro Enamel Corporation, 4150 East 56th St., Cleveland, Ohio

## WAR CONFERENCE GENERAL SESSION (concluded)

**Ball Room**

**Monday Afternoon, April 3, 1944: 2:30 P.M.–4:30 P.M.**

**Chairman: Cecil Eugene Bales, Ironton Fire Brick Company, Ironton, Ohio**

**2:30–3:00 P.M.**

**5. Ceramic Problems and Application of Wage Incentive Methods Thereto**

By Edward F. Borden: Douglas T. Sterling Company, Curley Building, Stamford, Conn.

**3:00–3:30 P.M.**

**6. Industry Prepares for Peace**

By John A. Stephens: United States Steel Corporation of Delaware, Pittsburgh, Pa. (*Chairman*, Allegheny County Committee for Economic Development)

**3:30–4:00 P.M.**

**7. Industrial Design and Creative Postwar Thinking in Glass Clay, and Enamel Industries**

By J. Gordon Lippincott: Dohner and Lippincott, 500 Fifth Avenue, New York 18, N. Y.

**4:00–4:30 P.M.**

**8. Chemistry in Defense and Recovery**

By Edward R. Weidlein: Mellon Institute of Industrial Research, Pittsburgh 13, Pa.

## Meeting Schedule

**Saturday, April 1**

2:00–6:00 P.M. (followed by Dinner-Meeting)

Board of Trustees Executive Meeting with Past-Presidents and Committee Chairmen, Class, and Local Section Officers

**Sunday, April 2**

10:00 A.M.–1:00 P.M. Fellows Meeting
1:00–2:30 P.M. Ceramic Educational Council Luncheon Meeting
2:30–5:30 P.M. Institute of Ceramic Engineers Meeting
6:30–8:00 P.M. Keramos Conclave and Dinner
8:00–9:00 P.M. Address by President Cecil Eugene Bales followed by Business Meeting
9:00 P.M. Edward Orton, Jr., Fellow Lecture by H. C. Hottel, Cambridge, Mass.

**Monday, April 3**

10:00 A.M.–5:00 P.M. General Sessions—Second War Conference
7:00 P.M. General Informal Dinner and Entertainment, $3.00 per plate

**Tuesday, April 4**

7:30 A.M. Ceramic Educational Council Breakfast Meeting
9:00 A.M.–5:00 P.M. Division Meetings
7:00–9:00 P.M. Alumni Dinners and Ceramic Camera Club Dinner
9:30 P.M. Dance and Entertainment

**Wednesday, April 5**

9:30 A.M.–5:00 P.M. Division Meetings
12:30–2:00 P.M. General Luncheon
Address: "Eighteenth Century English and Irish Glass" By Douglas C. Carson: Steuben Glass, Incorporated, New York, N. Y.

## EVENING SOCIAL EVENTS

**Sunday, April 2**

8:00–9:00 P.M. President's Address by Cecil Eugene Bales
9:00 P.M. Edward Orton, Jr., Fellow Lecture by H. C. Hottel

**Monday, April 3**

7:00 P.M. General Informal Dinner and Entertainment, $3.00 per plate

**Tuesday, April 4**

7:00–9:00 P.M. Alumni Dinners and Ceramic Camera Club Dinner
9:30 P.M. Dance and Entertainment

## Meeting Room Assignments

**Ladies' Headquarters—Parlors 566, 568, 570**

Ceramic Camera Club Exhibit—Parlors E and F
Design Division—Forum Room
Enamel Division—Adonis Room
Glass Division—Cardinal Room
Materials and Equipment Division—Parlors B and C
Refractories Division—Urban Room
Structural Clay Products Division—Silver Room
White Wares Division—Ball Room
Press—Parlor G

## Edward Orton Jr., Fellow Lecture
## "Infraray Heating"

### Speaker: Hoyt C. Hottel, Department of Fuel Engineering, Massachusetts Institute of Technology

Hotel William Penn: Ball Room

Sunday Evening, April 2, 1944: 9:00 P.M.

Professor Hottel was born at Salem, Ind., January 15, 1903. He took his A.B. degree in chemistry at Indiana University in 1922 and a Master's degree at the Massachusetts Institute of Technology in 1924.

Since 1928, he has been in charge of work in fuel engineering under the Department of Chemical Engineering at the Institute. For the past few years, he has had a special assignment for research work under an endowment established at the Institute by Godfrey L. Cabot for the study of the utilization of solar energy.

At present, he is conducting research work for the National Defense Research Committee of the Office of Scientific Research and Development.

## LADIES' ENTERTAINMENT

**Headquarters Hotel William Penn: Parlors 566, 568, 570**

Mrs. W. C. Rueckel, *Chairman*

**Sunday Evening: 9:00 P.M.**

Edward Orton, Jr., Fellow Lecture: Infraray Heating
By Hoyt C. Hottel: Department of Fuel Engineering, Massachusetts Institute of Technology, Cambridge 39, Mass.

**Monday Afternoon: 4:00 P.M.**

Tea: Ladies' Headquarters, Parlors 566, 568, and 570

**Monday Evening: 7:30 P.M.**

Subscription Dinner, Ball Room ($3.00 per plate)

**9:30 P.M.**

Dance and Entertainment

**Tuesday Afternoon: 1:00 P.M.**

Bridge Luncheon: Twentieth Century Club, East End, Pittsburgh

**Tuesday Evening: Dinner Hour**

Alumni Dinners (places to be announced)

**9:30 P.M.**

Informal Dance and Floor Show: 17th Floor Ball Room, Hotel William Penn

**Wednesday Noon: 12:30 P.M.**

Luncheon Lecture, 17th Floor Ball Room, Hotel William Penn
"Eighteenth Century English and Irish Glass" (including exhibition of some very fine and famous examples of old ceramics)
By Douglas C. Carson: Steuben Glass, Incorporated, New York, N. Y.

## Ceramic Camera Club: Sixth Annual Exhibit

**All Week: Parlors E and F**

**Board of Control**

G. P. COLE, Montreal, Canada
CARL H. RAPP, Milwaukee, Wis.
C. L. BABCOCK, Toledo, Ohio
V. H. REMINGTON, *Chairman* and *Secretary-Treasurer*, Washington, Pa.
E. L. HETTINGER, Reading, Pa.

**Jury of Selection**

ROSS ALTWATER, 9 Wood St., Pittsburgh, Pa.
W. O. BRECKON, Forbes Bldg., Pittsburgh, Pa.
O. E. ROMIG, 425 Olympia Road, Chatham Village, Pittsburgh, Pa.

**Committee for Frazier Award of Merit**

WALTER A. WELDON, Baltimore, Md.
F. J. VON TURY, Perth Amboy, N. J.

**Tuesday Evening, April 4, 7:00–9:00 P.M.**
**Annual Dinner and Announcement of Prizes**

## LOCAL COMMITTEE PERSONNEL

*General Chairman*, A. P. Thompson, Mellon Institute, Pittsburgh, Pa.
*Pittsburgh Local Section Chairman:* W. C. Rueckel, Koppers Company, Pittsburgh, Pa.
Dr. Thompson and Dr. Rueckel, together with the Chairmen of the Committees listed below, constitute the Executive Committee

**Entertainment Committee**

*Chairman*, Harold E. Simpson, Mellon Institute
MR. AND MRS. FRANCIS C. FLINT, Hazel-Atlas Glass Company, Washington, Pa.
MR. AND MRS. N. S. GARBISCH, Garco Products, Incorporated, Butler, Pa.
MR. AND MRS. ERNEST HOMMEL, O. Hommel Company, Pittsburgh, Pa.
MR. AND MRS. W. KEITH MCAFEE, Universal Sanitary Manufacturing Company, New Castle, Pa.
MR. AND MRS. A. A. WELLS, Homer Laughlin China Company, Newell, W. Va.

**Ladies' Entertainment**

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H. G. WILCOX, Harbison-Walker Refractories Company, Hays, Pa.

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*Chairman:* E. C. HENRY, Pennsylvania State College, State College, Pa.

**Publicity Committee**

*Chairman:* F. W. ADAMS, Pittsburgh Plate Glass Company, Pittsburgh, Pa.
J. S. GREGORIUS, Pittsburgh Plate Glass Company
A. W. KIMES, *National Glass Budget*, Pittsburgh, Pa.

**Ceramic Camera Club**

*Chairman:* VICTOR H. REMINGTON, B. F. Drakenfeld & Company, Incorporated, Washington, Pa.

## OHIO STATE UNIVERSITY ALUMNI DINNER

The Ohio State University dinner commemorating the Fiftieth Anniversary of the birth of ceramic engineering education will be held in the Blue Room of the Hotel Roosevelt, Tuesday, April 4, at 6:30 P.M. Tickets will be available on Monday, April 3.

## PENN STATE ALUMNI DINNER

The Pennsylvania State College Alumni Dinner will be held at the Hotel Pittsburgher, Tuesday, April 4, at 6:30 P.M. Ladies are invited.

## RUTGERS UNIVERSITY ALUMNI DINNER

Rutgers Universiyy Alumni will hold their dinner at the Hotel William Penn, Tuesday, April 4, at 6:00 P.M.

# DESIGN DIVISION PROGRAM

**Chairman:** W. A. Weldon, Locke Insulator Corporation, Baltimore, Md.
**Secretary:** Myrtle M. French, Art Institute of Chicago, Chicago, Ill.

**Program Committee**
H. E. Simpson, Chairman, Mellon Institute, Pittsburgh 13, Pa.
Rexford Newcomb, Jr., Bureau of Industrial Conservation, War Production Board, Washington, D. C.

## Hotel William Penn: Forum Room

**Tuesday Forenoon, April 4, 1944: 9:00 A.M.–12:00 M.**

1. Committee Reports and Business Meeting

**Tuesday Afternoon, April 4, 1944: 2:00 P.M.–4:30 P.M**

2. Review of Questionnaires

# DESIGN DIVISION PROGRAM (continued)

## Forum Room

**Wednesday Forenoon, April 5, 1944: 9:00 A.M.–12:00 M.**

**9:00 A.M. (Ball Room)**

**3. The Designer and Technologist Has Shared a Common Interest in Production of American Dinnerware**

BY VINCENT BROOMHALL: Edwin M. Knowles China Company, East Liverpool, Ohio

**Members of the Design Division will meet in the Ball Room with the White Wares Division for the presentation of this paper.**

## Forum Room

**10:30 A.M.**

**4. Practical Applications of the Silk-Screen Process in the Ceramic Industry**

BY V. H. REMINGTON: B. F. Drakenfeld & Company, Inc., Washington, Pa.

The silk-screen process has become an important method in the application of permanent labels to bottles and as a means for decorating ceramic ware in general. Adapting the process to usual and unusual ware shapes as well as the various types of equipment being used is discussed.

**5. Short Symposium on "Latest Improvements in Screen Printing Decoration"**

A practical paper for shop men.

## DESIGN DIVISION PROGRAM (continued)

### Forum Room

**Wednesday Afternoon, April 5, 1944: 2:00 P.M.–4:30 P.M.**

**2:00 P.M.**

**6. Products Design, a Key to Better Living**

By D. L. Hadley: Design Consultant, Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.

The author will discuss designs ranging from hardware to houses.

**3:30 P.M.**

**7. Technique of Pottery Manufactured in Modern Syria During the Neolithic and Bronze Ages**

By Frederick R. Matson: 224 Decatur Place, N. W., Washington, D. C.

### Supplementary Titles

**8. Effect of Firing Atmosphere on Development of Colors in Ceramic Glazes**

By William F. McDevit: 185 Forest Ave., Thompkinsville, Staten Island, N. Y.

The effect of systematic variations in atmosphere between 100% oxidizing and 100% neutral are noted. The principles and definitions of color designation are included. Consideration is also given to possible physicochemical changes which result in color variation. Experimental data indicate the relative stability of typical colors under atmospheric variations.

**9. Strontia and Its Properties in Glazes**

By Earl S. McCutchen: Engineering Experiment Station, Ohio State University, Columbus 10, Ohio

Strontia replacements of lead, zinc, and calcium oxides in a typical dinnerware glaze were studied relative to their thermal expansion, fusibility, fused viscosity, solubility, and fit properties. Data provided by these tests show that strontia (1) is a strong flux, (2) has thermal expansion properties similar to those of lime, (3) depresses the fusion temperatures, and (4) increases fluidity. A series of experimental glazes was developed and tested employing strontia in leadless and low-lead types which maintained the visual and physical properties of normal lead glazes.

**10. Leadless Dinnerware Glazes**

By John Marquis: Engineering Experiment Station, Ohio State University, Columbus 10, Ohio

An investigation was made to develop leadless glazes maturing in the range of cones 4 to 6 to fit both vitreous and semivitreous dinnerware bodies. One hundred and seventy experimental glazes have been developed and tested, each incorporating one or more of the following oxides as a substitute for lead: magnesium oxide (dolomite, talc), barium oxide (barium carbonate), strontium oxide (strontium carbonate), zinc oxide (zinc oxide), lithium oxide (lithium carbonate, lithospar), beryllium oxide (beryllium oxide, beryl), bismuth oxide (bismuth oxide, bismuth subnitrate), and fluorine (fluorspar, cryolite, sodium silicofluoride, topaz).

**11. Cone 01 Glazes for Low-Temperature Porcelains**

By John Marquis: Engineering Experiment Station, Ohio State University, Columbus 10, Ohio

An investigation was conducted to develop a cone 01 glaze to fit a nepheline syenite, vitreous body biscuited at cone 5. The purpose of the glaze was to incorporate the qualities of hardness, resistance to corrosion, and good appearance found in the higher temperature porcelain glazes. Other methods than lowering the alumina-silica content of the standard cone 5 dinnerware glaze were used therefore to decrease the maturing temperature. The principles employed were (1) presmelting most of the silica content in the frit and (2) increasing the multiplicity of the RO group in order to determine the best combination of bases to form complex eutectics by triaxial studies.

*Thanks to* CARL J. UHRMANN

*Imperial Glass Corporation, Bellaire, Ohio*

FOR THE HANDSOME GLASS MEDALLION BADGES

# ENAMEL DIVISION PROGRAM

**Chairman:** D. G. Bennett, Department of Ceramic Engineering, University of Illinois, Urbana, Ill.
**Secretary:** D. G. Moore, Ceramic Division, National Bureau of Standards, Washington, D. C.

**Program Committee**
H. D. Carter, Chairman, Harshaw Chemical Company, Cleveland, Ohio

## Hotel William Penn: Adonis Room

**Tuesday Forenoon, April 4, 1944: 9:00 A.M.–12:00 M.**

### 1. Mechanics of Enamel Adherence: XVI, Influence of Manganese Oxide on Metal Precipitation at Ground-Coat Interfaces

By R. M. King: Department of Ceramic Engineering, Ohio State University, Columbus 10, Ohio

The role of cobalt and nickel oxides in material precipitation in ground coats has been reported in previous papers. This paper offers experimental data on the influence of manganese oxides when used alone and with mixtures of cobalt and nickel oxides. As in previous work, the electrical conductivity method was used.

### 2. Abrasion Resistance of Porcelain Enamels

By Clark Hutchison: Ingram-Richardson Manufacturing Company of Indiana, Inc., Frankfort, Ind.

The abrasion resistances of enamels, differing in composition and properties, were determined by the test for Resistance of Porcelain Enamels to Surface Abrasion (standard of the Porcelain Enamel Institute, March, 1942). Although a rather wide range of abrasion indices was obtained, the majority of the enamels gave relatively close results. No one class of enamels stood out as being superior to others. The $SiO_2$ content of a base frit was progressively decreased with corresponding effects noted on acid resistance, specular gloss, and abrasion resistance. Results showed that abrasion index was affected by formula change.

### 3. Chemical Durability of Porcelain Enamels

By Ralph L. Cook and Andrew I. Andrews: Department of Ceramic Engineering, University of Illinois, Urbana, Ill.

The resistance of representative porcelain enamel surfaces to the chemical attack of different concentrations of various solutions was investigated in considerable detail. Cylindrical cup-shaped, commercially drawn samples were coated with the following enamels: ground coat, white fluoride cover, white antimony cover, white zirconium cover, acid-resistant white cover, sign blue cover, blue zirconium, commercial acid-resistant blue cover, and a commercial acid-proof blue cover. The loss in weight of these enamel surfaces, after exposure to chemical attack, was measured at selected time intervals. The solutions studied consisted of different concentrations of the inorganic acids, alkalis, several organic acids, as well as numerous salts at both room and boiling temperatures. The respective enamel surfaces showed considerable variation in their resistance to the chemical attack of the different concentrations of the various solutions.

### 4. Properties of Enamel Slips, I

By Burnham W. King, Jr., Herbert D. Carter, and Harry C. Draker: Harshaw Chemical Company, Cleveland, Ohio

Five clays and their properties when used to suspend porcelain enamels were studied. Fundamental data were first obtained on the clays, which were then milled in different proportions with several types of porcelain enamel frits. The properties of the resulting slips were studied. The pickup weight, that is, the amount of enamel retained on a ground-coated plaque which had been dipped in the slip and allowed to drain, was used as a basis of comparison.

### 5. Enameled Utensil Manufacturers' Council Standard Thermal-Shock Test for Porcelain Enameled Cooking Utensils

By F. A. Petersen and A. I. Andrews: Department of Ceramic Engineering, University of Illinois, Urbana, Ill.

The equipment and method used in testing porcelain enameled utensils for thermal-shock resistance are described. Results based on many tests indicate that increased thickness of enamel results in lower thermal-shock resistance.

**Enamel Division Luncheon and Business Meeting**

**Adonis Room**

**Tuesday Noon, April 4, 1944: 12:30 P.M.–2:00 P.M.**

## ENAMEL DIVISION PROGRAM (continued)

### Adonis Room

**Tuesday Afternoon, April 4, 1944: 2:00 P.M.–4:30 P.M.**

**6. Relation of Metal Gauges and Enamel Thickness to Impact Resistance of Porcelain Enameled Utensils**

By F. A. Petersen and A. I. Andrews: Department of Ceramic Engineering, University of Illinois, Urbana, Ill.

Three series of standard two-quart pudding pans made of different-gauge metal and coated with one, two, and three coats of enamel were tested for impact using the E.U.M.C. standard impact test. Impact resistance increased with increase in metal gauge and also with increase of enamel thickness.

**7. Relation of Bottom Radius to Impact Resistance of Porcelain Enameled Utensils**

By F. A. Petersen and A. I. Andrews

Two series of enameled utensils were tested for impact, using the E.U.M.C. standard impact test. The ware tested in each group had the same metal thickness and enamel thickness, but the bottom radius varied. From the results, impact resistance was found to increase with the increase in bottom radius.

**8. Symposium on Tests**

*Chairman*, R. L. Cook: Department of Ceramic Engineering, University of Illinois, Urbana, Ill.

## ENAMEL DIVISION PROGRAM (continued)

### Adonis Room

**Wednesday Forenoon, April 5, 1944: 9:00 A.M.–12:00 M.**

**9. The Ceramic Engineer in Porcelain Enameling Plants**

By Charles S. Pearce: Porcelain Enamel Institute, 1010 Vermont Avenue, Washington 5, D. C.

The return of ceramic engineers from the armed forces will provide the necessary group of technically trained men to staff porcelain enamel plants properly. Until recently, very few ceramic engineers have been used in control of operations. The trend immediately preceding the war was to use more of these men in supervisory capacities. It is anticipated that, after the war men with technical training will rapidly assume executive responsibilities in the industry.

**10. Raw Material for Porcelain Enamels, Survey of Current Markets and Allocations**

By John W. Iliff: Harshaw Chemical Company, 1945 East 97th Street, Cleveland, Ohio

Although many raw materials for porcelain enamel have been restricted, either by market shortages or by WPB regulations, all important raw materials except tin oxide are currently available in at least moderate quantity. A group of materials warranting individual attention is considered.

**11. Uverite, Mill-Addition Opacifier for Porcelain Enamels**

By C. J. Harbert and John W. Iliff: Harshaw Chemical Company, 1945 East 97th Street, Cleveland, Ohio

Uverite is the trade name for an antimony-titanium opacifier, having an approximate formula of $7CaO \cdot CaF_2 \cdot 6TiO_2 \cdot 2Sb_2O_5$. When compared with tin oxide in a range of commercial enamels, Uverite proves to be equivalent in its effect on opacity, color, gloss, firing range, general workability, and durability.

**12. Observations Indicating Absence of Plastic Flow in Sheet-Iron Ground Coat**

By W. G. Martin and F. W. Lauck: A. O. Smith Corporation, Milwaukee 1, Wis.

Iron rings were enameled; some were split at one point immediately and others one or two years later. Identical movement of the rings caused by compression forces in the glass indicates that no plastic flow takes place in the glass. The compressive stresses were calculated and were found to be of the general order of 10,000 p.s.i. The method of calculation is discussed.

**13. Tests for Hot-Water Resistance of Tank Enamels**

By W. N. Harrison and D. G. Moore: National Bureau of Standards, Washington, D. C.

The resistance of a representative group of commercial tank enamels and of several nontank enamels to attack by hot water was measured by loss of thickness and loss of gloss, respectively. The specimens were treated (*a*) for periods up to several hours in a conventional autoclave with distilled water, (*b*) up to 5000 hours in a modified autoclave with builtup air pressure and aerated, circulating tap water, and (*c*) for one day to two weeks in apparatus which kept the specimens in contact with constantly changing, boiling, distilled water. The tests are described in detail, and the application of the data to porcelain enameled hot-water tanks in actual service is discussed.

**General Luncheon—Ball Room**

**Wednesday Noon, April 5, 1944: 12:30 P.M.–2:00 P.M.**

**Address: Eighteenth Century English and Irish Glass**

**By Douglas C. Carson: Steuben Glass, Incorporated, New York, N. Y.**

## ENAMEL DIVISION PROGRAM (concluded)

### Adonis Room

**Wednesday Afternoon, April 5, 1944: 2:00 P.M.–4:30 P.M.**

**14. Effect of Ground-Coat Enamels on Reflectance of Cover-Coat Enamels**

By P. C. Stufft: Pemco Corporation, Baltimore, Md.

The effect of various types of ground coat on the reflectivity of opaque and superopaque cover-coat enamels was determined, and the results are described.

**15. Use of Potassium Dichromate Method in Determining Iron Content of Pickle Acids**

By E. G. Porst: Pemco Corporation, Baltimore, Md.

The metallic iron content of sulfuric acid pickle solutions has for many years been determined by the potassium permanganate method. Developments in the field of indicators has made possible the use of potassium dichromate with the elimination of many of the difficulties previously encountered when potassium permanganate was used. A description of the method and a discussion of results are given.

**16. Panel Discussion of Questions Submitted by Men in Industry**

(*a*) R. M. King: Department of Ceramic Engineering, Ohio State University, Columbus 10, Ohio

(*b*) A. I. Andrews: Department of Ceramic Engineering, University of Illinois, Urbana, Ill.

(*c*) F. R. Porter: Inland Steel Company, Indiana Harbor, Ind.

(*d*) C. S. Pearce: Porcelain Enamel Institute, Washington, D. C.

(*e*) B. T. Sweely: Chicago Vitreous Enamel Product Company, Circero, Ill.

(*f*) L. E. Nordholt: Tennessee Enamel Manufacturing Company, Nashville, Tenn.

(*g*) R. R. Danielson: Metal & Thermit Corporation, Carteret, N. J.

# GLASS DIVISION PROGRAM

**Chairman:** J. F. Greene, Kimble Glass Company, Vineland, N. J.
**Secretary:** S. R. Scholes, New York State College of Ceramics, Alfred, N. Y.

**Program Committee**
K. C. Lyon, Armstrong Cork Company, Millville, N. J.

## Hotel William Penn: Cardinal Room

**Tuesday Forenoon, April 4, 1944: 9:00 A.M.–12:00 M.**

### 1. Glass in the Electronics Industry

By H. C. Steiner: Tube Division, General Electric Company, Schenectady, N. Y.

Electronic tube design is concerned with properties of glass which are of little importance in other fields. In particular, the glass must be of such composition that it may be sealed to metallic leads and parts. The seal must be vacuum-tight. The expansion of the glass and metal must be closely matched or, with dissimilar characteristics, the design must limit the glass stresses to safe values. The glass must also have sufficient resistance at the operating temperature to prevent electrolysis. Some of these special characteristics are reviewed, and the current use of glass in the electronics industry is discussed.

### 2. Effect of Fluorine and Phosphorus Pentoxide on Certain Physical and Chemical Properties of Glass

By Owens-Illinois Research Laboratory: Owens-Illinois Glass Company, Toledo 1, Ohio

The effect of the substitution of fluorine for silica on the viscosity, liquidus temperature, and chemical durability of a typical soda-lime glass is shown. The effects of substitution of $P_2O_5$ for (*a*) silica and (*b*) dibasic oxides in two typical soda-lime glasses are also shown.

### 3. Effect of Fluorides on Glass

By Paul M. Corbett: Pennsylvania Salt Manufacturing Company, Philadelphia, Pa.

### 4. Properties of Some Vycor-Brand Glasses

By M. E. Nordberg: Corning Glass Works, Corning, N. Y.

Physical and chemical properties are discussed for Vycor-brand glasses prepared from lower silica glasses by leaching processes. A brief résumé of the process is given. Some porous properties of the intermediate leached glass are given. Also, mention is made of a multiform glass prepared by powdering a high silica glass, casting into the desired shape, and refiring.

### 5. Surface Tension and Persistence of Cords in Glass

By Mellen A. Knight: Preston Laboratories, Butler, Pa.

The action of surface tension in molten glasses is discussed in relation to cord persistence. An examination is made of the reported mechanism for the solution of cords as proposed by H. Jebsen-Marwedel. His viewpoint that the shape of immersed cords is governed by surface-tension differences between the cord and matrix glasses appears to be in conflict with the physics involved. The possible influences of interfacial tension on the shape of cords and on their location in or on the melt are considered along with its relation to other physical forces. The only stable form for cords under the influence of interfacial tensions alone is concluded to be a spherical one. Other factors, such as high viscosities, varying diffusion rates, and mechanical and thermal stirring, cause the irregular shapes found in practice. The relation of surface tensions to these factors requires further study.

### 5A. Study Spectral of Transmission of Glass at High Temperatures

By Harold C. Johnson: Corning Glass Works, Corning, N. Y.

Spectral-transmission curves are given for a series of $K_2O$-$B_2O_3$ glasses colored with $Co_2O_3$ as well as a base glass of 10% $Na_2O$, 20% $B_2O_3$, and 70% $SiO_2$ with eight different color oxides added. The transmission measurements were made from room temperature up to 500°C. with a G E automatic recording photoelectric spectrophotometer.

**Glass Division Luncheon and Business Meeting**
**Cardinal Room**
**Tuesday Noon, April 4, 1944: 12:30 P.M.–2 00 P.M.**

## GLASS DIVISION PROGRAM (continued)

### Cardinal Room

**Tuesday Afternoon, April 4, 1944: 2:00 P.M.–4:00 P.M.**

### Hand Plant Session

**6. Glasshouse Stones**

By W. L. Fabianic: Owens-Illinois Glass Company, Alton, Ill.

Most of the various types of glass stones actually found under operating conditions in soda-lime bottle glass furnaces are discussed. Each type is described in detail, and several photomicrographs of each kind of stone are shown. The possible source of each type of stone is considered as well as general methods for its identification and elimination. Auxiliary aids in helping the petrographer, such as the use of solvent acids and chemical analyses, are touched on. Stone specimens from flint, amber, and green glasses are described.

**7. Cords**

By L. G. Ghering: Preston Laboratories, Butler, Pa.

Cordy glass is troublesome in the manufacture of any line of glassware for several reasons, namely, (1) interference in the fabrication process, (2) inferior mechanical strength of the ware, and (3) appearance and other defects in the ware. Cords are composition variations in the melt, and all difficulties with them arise from this composition difference. The composition heterogeneity may arise from unmixed batch, poor mixing in the melt, or refractory contamination in the melt. There is no general rule for the diagnosis of their origin whether in tanks or pots. The degree of cordiness may be measured by density differences (melt) or by measurement of the strain (in the ware) in a polariscope. In the latter method, it is best to look at a section of the ware edgewise.

**8. Decolorizing Pot Glass**

By S. R. Scholes: New York State College of Ceramics, Alfred, N. Y.

The principles of decolorizing are reviewed, and the influence of iron content of raw material, oxidizing or reducing agents in the batch, chemical and physical decolorizers, and possible substitution of other reagents for restricted chemicals is discussed.

**9. Suggestions Concerning Pots in Hand Plants**

By Axel Ottoson and C. J. Uhrmann: Imperial Glass Corporation, Bellaire, Ohio

The importance of low porosity to get longer life and fewer cords and stones is discussed, and suggestions are presented for lowering porosity. Various methods of preheating are listed, and new pot materials and designs are described.

**4:00 P.M.**

**10. American Society for Testing Materials**

Subcommittees of Committee C-14 on Glass and Glass Products

### General Luncheon—Ball Room

**Wednesday Noon, April 5, 1944: 12:30 P.M.–2:00 P.M.**

**Address: Eighteenth Century English and Irish Glass**

**By Douglas C. Carson: Steuben Glass, Incorporated, New York, N. Y.**

## GLASS DIVISION PROGRAM (continued)

### Cardinal Room

**Wednesday Forenoon, April 5, 1944: 9:00 A.M.–12:00 M.**

### 11. Qualitative Spot Tests for Minor Constituents in Glass

By Samuel Zerfoss and R. L. Hess: Pennsylvania State College, State College, Pa.

A procedure is outlined for routine qualitative analysis of certain minor constituents of glass by means of microspot tests using organic reagents according to the technique of Feigl. The theory, details, interferences, and limits of detection of various chemical reactions involved are briefly outlined. A technique is discussed for the nondestructive testing of glass specimens. The method shows promise as a practical laboratory and plant tool.

### 12. Energy Additivity in Glasses

By Maurice L. Huggins and Kuan-Han Sun: Eastman Kodak Company, Rochester, N. Y.

Energies of dissociation into the component ions have been computed for about fifty oxides. From these and the coordination numbers, "ionic contact energies" have been computed. These may be used additively to compute approximate ionic dissociation energies in crystals and glasses in which each "metallic" atom is surrounded as in its simple oxide. Deviations from additivity result from changes in coordination number. The ionic contact energy of a Si–O contact depends also on whether the oxygen is in contact with two silicons or only with one (plus other more electropositive atoms).

### 13. Effect of Substituting MgO for CaO on Certain Physical and Chemical Properties of Typical Soda-Lime Glasses

By General Research Laboratory: Owens-Illinois Glass Company, Toledo 1, Ohio

In base glasses containing (*a*) 14% of sodium oxide, 12% of calcite lime, and 74% of silica and (*b*) 16% of sodium oxide, 10% of calcite lime, and 74% of silica, magnesia (MgO) was substituted in steps of 2% for CaO. The effect of the substitution on liquidus temperature, viscosity, fiber softening point, and the resistance of the glasses to dilute acid and to distilled water is described.

### 14. Nickel-Bearing Diopsides

By M. A. Knight and F. W. Preston: Preston Laboratories, Butler, Pa.

The liquidus has been determined for the binary system, $CaO{\cdot}MgO{\cdot}2SiO_2$–$CaO{\cdot}NiO{\cdot}2SiO_2$. Studies have been made on the partial substitution of nickel oxide for magnesia in dolomitic window glasses; the resulting changes in the liquidus temperatures and in the primary phase were investigated. The application of these results to the production of colored sheet glass is discussed.

### 15. Effect of Temperature on Homogenizing Rate of Soda-Lime-Silica Glass

By R. L. Tiede and F. V. Tooley: Owens-Corning Fiberglas Corporation, Newark, Ohio

The rate of homogenizing with respect to temperature of a soda-lime-silica glass, under conditions of minimum convection mixing and in the absence of refractory materials, was studied, using the centrifugal-density spread technique. A constant melting period of four hours was observed and the temperature interval from 1230° to 1450°C. was covered in 38° increments. Increasing temperatures within the limits observed were found to have a quite limited effect on the homogenizing rate. This result was studied and interpreted further in terms of surface volatilization, composition of top and bottom glass, and diffusion mixing.

### 16. Lewis Acid-Base Theory Applied to Glass

By Kuan-Han Sun and Alexander Silverman: University of Pittsburgh, Pittsburgh, Pa.

A comparison is made of the classical, the Brönsted, and the Lewis theories of acids and bases. After showing that neither the classical nor the Brönsted theories can be applied to reactions involved in the production of glass, the Lewis theory is applied. Structural formulas are shown which illustrate the application of the Lewis theory.

**11:30 A.M.**

### 17. American Society for Testing Materials, Committee C–14 on Glass and Glass Products.

*Chairman*, J. C. Hostetter: Mississippi Glass Company, St. Louis 7, Mo.

## GLASS DIVISION PROGRAM (concluded)

### Parlors B and C

**Wednesday Afternoon, April 5, 1944: 2:00 P.M.–4:30 P.M.**

### Symposium on "Optical Glass"

**Chairman: Frank L. Jones, Bausch & Lomb Optical Company, Rochester, N. Y.**

**Concurrent Symposium on "Glass Furnace Operation" in Cardinal Room**

#### 18. Light Absorption of Iron in Various Base Glasses

By W. A. Weyl: 733 Jackson Street, State College, Pa.

It is well known that the tinting power of iron depends on its state of oxidization. The light absorption of ferric oxide, ferrous oxide, and a combination of both will be discussed. In glasses of widely varying composition, such as optical glasses, the role which the ferric ion assumes in the structure of glass must be considered.

#### 19. Chemical Reactions of the Surface of Optical Glass: I–II

By H. C. Hafner and N. J. Kreidl: Bausch and Lomb Optical Company, Rochester, N. Y.

Theoretical and practical aspects of surface cleaning and surface treatments are presented.

#### 20. Deterioration of Glass in Tropical Use

By Frank L. Jones: Bausch and Lomb Optical Company, Rochester, N. Y.

The high humidity found in some regions is detrimental to lenses not only because of slow reactions between moisture and glass but also because the moisture promotes the growth of fungi which may cover the surfaces of lenses and prisms, rendering them opaque. Glass, itself, is not a food for fungi and little damage results if all materials from which a fungus could draw nourishment are excluded from the environment. Bad fungi damage may result where certain microscopic insects common to the tropics are permitted to infest the room or case in which an instrument is stored.

#### 21. Precision Apparatus for Rapid Determination of Indices of Refraction and Dispersion by Immersion

By Conrad A. Faick and Bernard Fonoroff: National Bureau of Standards, Washington, D. C.

A new immersion method for determining indices of refraction and V values, employing the double-diaphragm method for securing oblique illumination, is described. The average error in the determination of indices of refraction based on 144 measurements is $2 \times 10^{-5}$; the maximum error is $5 \times 10^{-5}$. Complete measurements of the indices of refraction for the sodium D line and the hydrogen C and F lines may be made in approximately $1^1/_2$ hours, and with these the V values may be calculated with an average error of 0.1 and a maximum error of 0.8.

#### 22. Variations of Refractive Index of Glass in the Annealing Region

By Harold McMaster: Libbey-Owens Ford Glass Company, Rossford, Ohio

The refractive index of a chilled fiber of borosilicate glass was found to increase according to the equation, $1/(N_s - N) - 1/(N_s - N_o) = At$, where $N_s$ is the equilibrium index and $A$ is a constant at constant temperature. Index data were extrapolated according to this equation to give $N_s$ for several temperatures between 900° and 1100°F. The change of $A$ with temperature was found to be well represented by the equation $\log A = K/T + C$, where $T$ is the absolute temperature and $K$ and $C$ are constants.

#### 23. Nonreflecting Films

By Frank L. Jones: Bausch and Lomb Optical Company, Rochester, N. Y.

A general survey of the optical properties and the durability of several types of thin coatings applied to glass to reduce the light lost by reflection from polished surfaces is presented.

#### 24. Time Problem in Annealing

By Aniuta Winter. Ecole Libre des Hautes Etudes, 66 Fifth Avenue, New York, N. Y.

The study of variation of refractive index of a glass as a function of temperature and time in the transformation region permits the determination of the shortest annealing schedule necessary to reach a given refractive index and a given degree of homogeneity. For a particular glass, the best annealing, i.e., the best stabilized state, corresponds to the highest refractive index. This maximum of stabilization is needed only for a few uses of great precision. For many other purposes, a glass less stabilized can be used if it is sufficiently homogeneous.

The speed of variation of refractive index at constant temperature changes rapidly with temperature in the transformation regions. Equilibrium is reached in a few minutes near the upper limit of this region, but several hundred hours are required at the lower limit. By making proper use of this rapid variation of the speed of transformation within relatively small limits of temperature, an annealing schedule can be established to obtain a fairly high degree of homogeneity without reaching the highest value of refractive index but with enough stability for many practical purposes.

This result is obtained by freezing the glass at a certain state of equilibrium corresponding to a temperature at which the transformation is slow enough to be neglected during the subsequent rapid cooling which insures homogeneity. For many practical applications, this procedure permits the attainment of an adequate degree of homogeneity in a considerably shorter time than would be necessary to reach a higher refractive index which may not be essential. The degree of homogeneity obtained is also the best possible for a given length of annealing schedule. For each particular use of glass, the degree of annealing needed is to be determined and corresponding cooling curves then established.

#### 25. Optical Glass from Viewpoint of Lens Designer

By R. Kingslake: Eastman Kodak Company, Rochester, N. Y.

The glass used in the manufacture of lenses must of course be chemically stable and substantially free from bubbles, color, and striae. The lens designer is then concerned only with the refractive index and the dispersive

## GLASS DIVISION PROGRAM (concluded)

### Cardinal Room

**Wednesday Afternoon, April 5, 1944: 2:00 P.M.–5:00 P.M**

### Symposium on "Glass Furnace Operation"

**(Concurrent Symposium on "Optical Glass" in Parlors B and C)**

power of the available glasses. Because practically every new lens must be achromatic, the positive elements used in it must be made from glass having a low dispersive power; the negative elements must have a relatively high dispersive power. The choice of refractive index is determined by many conflicting factors inasmuch as the only "tools" available to the designer for the correction of many different aberrations are the radii of curvature of the lens surfaces, the thicknesses and air spaces, and the refractive indices of the glasses. The range of optical glasses commercially available and the reasons underlying the designer's selection of glass for different kinds of lens are discussed.

**25A. Pot Attack in Melting and Optical Glasses**

By W. H. Parsons and Herbert Insley: National Bureau of Standards, Washington, D. C.

**26. Observations on Fuel Oil Consumption in Similar Container Glassmelting Furnaces**

By K. C. Lyon: Armstrong Cork Company, Millville, N. J.

A study has been made of heavy oil consumption in five similar glass furnaces melting bottle glass over a period of several campaigns. The effect of load, furnace age, and other factors on fuel requirements is indicated.

**27. Value of Automatic Combustion Control and Its Effect on Design and Operation of Furnaces**

By E. G. Smith: Amsler-Morton Company, Fulton Building, Pittsburgh, Pa.

The quality and color of glass can be largely controlled, assuming that the raw materials or batch are delivered to the furnace in the proper manner and an approved furnace design is used. Proper furnace design combined with automatic combustion controls will increase tank capacity.

**28. Application and Results in Use of Automatic Control in Glassmelting Furnaces**

By W. H. Hasselbach: Libbey-Owens-Ford Glass Company, Toledo, Ohio, and F. E. Early: Askania Regulator Company, Chicago, Ill.

The application of modern automatic control equipment such as combustion and furnace pressure control to glassmelting furnaces is described, and the improvement in over-all furnace performance which may be expected from their use is noted. Actual results obtained with glassmelting furnaces equipped with automatic controls from a standpoint of fuel savings, reduction of furnace maintenance, and improved product quality are given.

**29. Fume or Vapors from Molten Glass**

By C. A. Bradley, Jr.: Corning Glass Works, Corning, N. Y.

Molten glass baths are compared to solutions of more or less volatile constituents. Loss of the volatile materials is discussed as well as some effects on glass composition and properties and cord and stone formation.

**30. Round-Table Discussion**

(*a*) A. W. Dodge: Hazel-Atlas Glass Company, Zanesville, Ohio

(*b*) W. W. Oakley: Corning Glass Works, Corning, N. Y.

(*c*) J. W. Wright: Owens-Illinois Glass Company, Alton, Ill.

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**Supplementary Talk**

**Glass Science, Incorporated**

By Frank L. Jones: Vice-President, Glass Science, Inc.

A statement will be presented concerning the foundation of a research institute devoted to fundamental research in glass and related products. The purpose of the foundation and its policies in respect to research, publication, and membership will be outlined.

# MATERIALS AND EQUIPMENT DIVISION PROGRAM

**Chairman:** E. M. Rupp, Yancey Cyanite Company, Burnsville, N. C.
**Secretary:** J. F. Day, Donald Hagar Materials, Zanesville, Ohio

**Program Committee**
V. J. Roehm, Chairman, Kentucky Clay Mining Company, Alliance, Ohio

**Hotel William Penn: Parlors B and C**

**Members of the Materials and Equipment Division will meet with the White Wares Division for the Ball Clay Symposium**

**Ball Room**

**Tuesday Forenoon, April 4, 1944: 9:00 A.M.–12:00 M.**

## MATERIALS AND EQUIPMENT DIVISION PROGRAM (continued)

**Parlors B and C**

**Tuesday Afternoon, April 4, 1944: 2:00 P.M.–4:30 P.M.**

### 1. Beneficiation of Refractory Clays

By T. A. Klinefelter and Sidney Gottlieb: Southern Experiment Station, United States Bureau of Mines, Tuscaloosa, Ala.

A number of intermediate-grade fire clays were given sedimentary beneficiation for the purpose of increasing refractoriness. Increases of from two to ten cones were obtained.

### 2. Some Firing and Fired Properties of Diopside, Tremolite, and Wollastonite

By C. R. Amberg: New York State College of Ceramics, Department of Research, Alfred, N. Y.

Diopside ($CaO \cdot MgO \cdot 2SiO_2$), wollastonite ($CaO \cdot SiO_2$), and tremolite ($2CaO \cdot 5MgO \cdot 8SiO_2 \cdot H_2O$) occur in commercial quantities in New York State. Preliminary to studies on the use of these materials in ceramic products, their firing and fired characteristics together with their fusion points and softening ranges were determined.

### 3. Emulsions and Their Application to Ceramic Engineering

By Logan Grupelli: National Oil Products Company First and Essex Streets, Harrison, N. J.

The theory of emulsions and their properties are considered. An explanation is given for the failure of previous attempts to use emulsions. Recommendations are presented for the successful application of emulsions, and various types of emulsions, such as oils, resins, and waxes, are discussed.

### 4. The Ceramic Industry: Now and Postwar

By Rexford Newcomb, Jr.: Conservation Division, War Production Board, Washington, D. C.

A survey is made of the important types of ceramic products, with statistics concerning their wartime use and estimates as to postwar prospects. Particular emphasis is given to postwar applications in uses which have been developed during the war. In the long-term picture, export possibilities are decidedly good.

### 5. Flotation of Talc

By Hemming Franz: Eastern Magnesia Talc Company, Incorporated, Burlington, Vt.

## MATERIALS AND EQUIPMENT DIVISION PROGRAM (continued)

### Parlors B and C

**Wednesday Forenoon, April 5, 1944: 9:00 A.M.–12:00 M.**

**6. Dispersing Clays with a Colloid Mill**

By Robert Burdick: New York State College of Ceramics, Department of Research, Alfred, N. Y.

A ball clay, a stoneware clay, and a shale in slip form were passed through a colloid mill which was equipped with stone rotors. The products were extremely fine. The effects of this treatment on settling rates and on dry and fired properties were determined by comparing the products with those produced by ordinary slaking methods.

**7. Filter-Press Sacks, Fabrication and Suggestions for Their Use**

By F. A. Koch: National Sales Corporation, 31–35 E. Thirteenth St., Cincinnati 10, Ohio

Economical slip-house operation depends on the filter-press sack. The weight of the cloth and type of construction, treatment, and method of sewing the center are considered in relation to the press pressure and type of body filtered. Synthetic filter fabrics have possibilities for future use, but they are too expensive at the present time. Press plates should be cleaned and painted regularly. Sacks should fit properly to avoid losses through rim cuts and creasing and should be washed frequently as a factor in lengthening life and for efficient press operation.

**8. High-Alumina Clays of Pulaski and Saline Counties, Arkansas**

By Joshua I. Tracey, Jr.: U. S. Department of the Interior, Geological Survey, Little Rock, Ark.

Extensive deposits of kaolinitic clay and closely associated bauxite occur in Pulaski and Saline Counties, Arkansas, as products of early Cenozoic weathering of nepheline syenite. The clays of the bauxite-kaolin deposits normally contain more than 35% of alumina. Siderite is the principal impurity. The deposits for the most part are buried beneath sediments of Wilcox age or younger, but the overburden is thin or absent near outcrops of syenite. Deposits beneath overburden, which does not exceed 50 feet in thickness, probably total more than 100 million tons.

**9. Methods of Removing and Collecting Dust in Ceramic Plants**

By R. R. Robinson: Robinson Ventilating Company, Zelienople, Pa.

The reasons for dust collecting in plants are (*a*) to protect the health of the workers, (*b*) to protect machinery and equipment, and (*c*) to conserve the dust for its economic value. Methods of dust removal and collection are also discussed.

**10. Small Electrically Heated Kilns and Their Operating Characteristics**

By Ben A. Bovee: Globar Division, The Carborundum Company, Niagara Falls, N. Y.

The following subjects are discussed in this paper: (1) types of periodic kilns, (2) kinds of heating elements, (3) location of heating elements, (4) effect of weight of refractories on power consumption, and (5) factors affecting cost of operation.

**Supplementary Title**

**11. Cause of Unemployment**

By G. W. Lapp: Lapp Insulator Company, Incorporated, LeRoy, N. Y.

**General Luncheon—Ball Room**

**Wednesday Noon, April 5, 1944: 12:30 P.M.–2:00 P.M.**

**Address: Eighteenth Century English and Irish Glass**

**By Douglas C. Carson: Steuben Glass, Incorporated, New York, N. Y.**

## MATERIALS AND EQUIPMENT DIVISION PROGRAM

### Ball Room

**Wednesday Afternoon, April 5, 1944: 2:00 P.M.–4:30 P.M.**

**Members of the Materials and Equipment Division will meet with the White Wares Division**

# REFRACTORIES DIVISION PROGRAM

Chairman: C. L. Thompson, Harbison-Walker Refractories Company, Pittsburgh 22, Pa.
Secretary: S. M. Swain, North American Refractories Company, Cleveland, Ohio

Program Committee:
E. E. Callinan, Chairman, Timken Steel & Tube Company, Canton, Ohio
C. L. Norton, Jr., Babcock & Wilcox Company, 85 Liberty St., New York 6, N. Y.
E. B. Read, Mellon Institute, Pittsburgh 13, Pa.
C. A. Freeman, A. P. Green Fire Brick Company, Mexico, Mo.

Hotel William Penn: Urban Room

Tuesday Forenoon, April 4, 1944: 9:00 A.M.–12:00 M.

## Symposium on "Significance of Tests on Refractories"

Chairman: Clyde L. Thompson

### I. Introduction: Usefulness of Refractories Tests to Producer and Consumer

By S. M. PHELPS: Mellon Institute of Industrial Research, Pittsburgh 13, Pa.

### II. Significance of Specific Tests

#### 1. Significance of the Pyrometric Cone Equivalent Test of Refractories and Refractory Raw Materials

By R. B. SOSMAN: United States Steel Corporation, Kearny, N. J.

The principal point to be stressed is that the P.C.E. test is not a temperature measurement, certainly not a measure of "melting point" or "softening point." It is essentially a comparative measure of fluidity of certain materials under a prescribed heating schedule.

#### 2. Reheat Tests on Fire-Clay and Silica Refractories

By E. C. PETRIE AND C. P. WALTERS: North American Refractories Company, National City Bank Building, Cleveland 14, Ohio

Test data are included which show the effect of various firing temperatures and their relation to the changes brought about in the standard A.S.T.M. high-heat duty reheat test. Various other data are shown on brick made on different processes before and after reheating. Reheating tests were also conducted on standard silica brick to show the effect of variations in firing temperatures.

#### 3. Tests on Refractory Cements

By W. L. STAFFORD: Johns-Manville Research Laboratories, Manville, N. J.

#### 4. Panel Spalling Test

By L. C. HEWITT: Laclede-Christy Clay Products Company, St. Louis, Mo.

The panel spalling test is simulative in that the test is, in effect, on a wall. The test combines the effect of such factors as refractoriness, volume, stability, structure, modulus of elasticity, and thermal expansion on the ability of a brick to withstand thermal shock. The panel spalling test is used with a high degree of success in controlling and developing refractories to meet service needs.

#### 5. Hot Load Test

By H. M. KRANER: Bethlehem Steel Company, Bethlehem, Pa.

#### 6. Navy Simulative Service Test

By W. T. TREDENNICK: Lieutenant, U. S. Naval Boiler and Turbine Laboratory, Philadelphia, Pa., AND J. F. KELLY: Boiler and Turbine Laboratory, Philadelphia, Pa.

## Refractories Division Luncheon and Business Meeting

Urban Room

Tuesday Noon, April 4, 1944: 12:30 P.M.–2:00 P.M.

## REFRACTORIES DIVISION PROGRAM (continued)

**Urban Room**

**Tuesday Afternoon, April 4, 1944: 2:00 P.M.–4:30 P.M.**

### Symposium on "Significance of Tests on Refractories" (concluded)

**Chairman: C. L. Thompson**

#### III. Significance of a Testing Program

**7. Testing of Refractories from the Standpoint of Research**

By Fred A. Harvey and R. E. Birch: Harbison-Walker Refractories Company, Farmers Bank Building, Pittsburgh 22, Pa.

The development of new products depends on the development of testing methods. Some of these methods are described.

**8. Works Control of Uniformity of Refractories**

By E. R. Hannah: A. P. Green Fire Brick Company, Mexico, Mo.

The importance of control tests for individual physical and chemical properties as well as of uniformity of size and shape is discussed. The problem is divided into three standard tests in control of (*a*) finished product, (*b*) raw materials, and (*c*) processing materials.

**9. Significance of a Refractories Steel Testing Program in Steel Mills**

By W. S. Debenham: Carnegie-Illinois Steel Corporation, Chicago, Ill.

A general discussion is presented of the activities and aims of a steel plant refractories testing program and of the several factors that either favorably or adversely affect the significance of such work. Knowledge of service conditions and the necessity for their correlations with laboratory tests is stressed and the suitability of some standard tests is discussed.

**10. Significance of a Testing Program for Glasshouse Refractories**

By R. K. Smith: Corning Glass Works, Corning, N. Y.

The reasons for tests on refractories are summarized. The general types of refractory failure are given and the application of various tests to determine the resistance of refractories to the types of failure are discussed.

**11. Significance of Tests on Coke-Oven Refractories**

By W. C. Rueckel: Koppers Company, Pittsburgh, Pa.

### General Luncheon—Ball Room

**Wednesday Noon, April 5, 1944: 12:30 P.M.–2:00 P.M.**

**Address: Eighteenth Century English and Irish Glass**

**By Douglas C. Carson: Steuben, Incorporated, New York, N. Y.**

## REFRACTORIES DIVISION PROGRAM (continued)

**Urban Room**

**Wednesday Forenoon, April 5, 1944: 9:00 A.M.–12:00 M.**

### 12. Calcination of Topaz Ore in a Rotary Kiln

By Gordon R. Pole: Department of Chemical Engineering, Tennessee Valley Authority, Wilson Dam, Ala.

Reports by other investigators have indicated that calcined topaz might be useful as a substitute material for Indian kyanite, which has been used extensively for the fabrication of highly aluminous mullite-type refractories.

Experiments were carried out to determine the feasibility of calcining and defluorinating raw topaz in a rotary kiln. Fifteen tons of minus 1-in. topaz ore were calcined in a 25-ft. rotary kiln of 20-in. inside diameter. The investigation covered operation of the kiln at 2600° to 2950°F., and feed rates from 200 to 400 lb. per hour, with retention of the feed in the kiln from 70 to 120 minutes. The chemical composition, screen analyses, and apparent porosity of the feed and calcined product were determined. The most favorable operating conditions for the small rotary kiln were 2700°F. with a feed rate of 300 lb. per hour at a kiln rotation of 0.90 r.p.m. Products made under these conditions had an average fluorine content of 0.24% and an apparent porosity of about 19%. A dust loss of about 11% occurred during the calcination, but screen analyses showed no serious reduction in particle size from the heat-treatment.

From this investigation, it appears practicable to calcine and defluorinate raw topaz in a rotary kiln and obtain a product suitable for use in the manufacture of mullite-type refractories.

### 13. Development of a Refractory Highly Resistant to Thermal Shock

By George A. Loomis: Engineering Experiment Station, Ohio State University, Columbus 10, Ohio

With the object of developing a refractory composition having high heat-shock resistance, the effects on this property of additions of various minerals to a clay body have been studied. These minerals include several grades of talc, zircon, calcined kyanite, corundum, and combinations of the same minerals.

### 14. Factors Affecting the Pyrometric Cone Equivalent of Silica Fire Clay

By Raymond E. Birch and Morris P. Hall: Harbison-Walker Refractories Company, Pittsburgh 22, Pa.

A study was made of the factors affecting the pyrometric cone equivalent (P.C.E.) of silica fire clay made of ganister, clay, and silica. These factors include grind, mix proportions, and quality of raw materials.

### 15. Note on Cristobalite: Volume Change Attending Alpha to Beta Inversion of Cristobalite

By M. D. Beals: Development and Research Department, Bethlehem Steel Company, Bethlehem, Pa.; and Samuel Zerfoss, Department of Ceramics, Pennsylvania State College, State College, Pa.

The volume expansion of cristobalite, as it passes through the low-temperature inversion range, was studied by means of a dilatometer in which the cristobalite expands against a column of mercury. The volume change was measured in a capillary tube attached to the mercury column. The temperature of inversion is a function of the previous history of the cristobalite sample. The volume change may also depend on the heat-treatment that the sample receives during inversion. The influence of grain size, source of silica, catalysts, and heat-treatment on the temperature range and the volume expansion of the inversion is discussed. The knowledge thus obtained is applied to the problems of silica refractories.

### 16. Conversion of Certain Refractory Oxides to Suboxide Form at High Temperatures

By Carl A. Zapffe: Rustless Iron and Steel Corporation, Baltimore, Md.

A preliminary survey of information published in the fields of chemistry and physics on the suboxide forms SiO, TiO, ZrO, CrO, AlO, BO, VO, and CbO indicates a new field to be explored in determining the role of these suboxides in the service and failure of refractories and in the chemistry of slags. Several phenomena, at present little understood, such as devitrification in reducing atmospheres, volatilization of refractory oxides, and certain slag types now classed as anomalous, may find their explanation in the decomposition of the oxides to lower oxide forms under the favorable conditions of high temperature and low oxygen pressure which characterize much of their service. Such discrepant observations as those recently reported for the attack of silica brick by steam may also be brought into agreement.

### 17. Reaction Between Copper Reverberatory Slag and Refractories

By S. S. Kocatopcu: Division of Ceramics, Massachusetts Institute of Technology, Cambridge 39, Mass.

Small slag cylinders placed on top of different refractory brick were heated at 1300° and 1400°C. Depth and width of reaction and diffusion zones were measured, and thin sections through the penetrations were studied.

## REFRACTORIES DIVISION PROGRAM (concluded)

### Urban Room

**Wednesday Afternoon, April 5, 1944: 2:00 P.M.–4:30 P.M.**

### 18. Effect of Atmosphere on the Iron Oxide Bursting of Chrome-Magnesite Brick

By A. W. Robinson: Carnegie-Illinois Steel Corporation, Chicago, Ill.

Laboratory studies show that iron oxide bursting of a chrome-magnesite brick is brought about at 2800°F. and above in an oxidizing atmosphere. No bursting is in evidence in an atmosphere high in carbon monoxide. Tests were conducted in an oxyacetylene-fired cylindrical furnace with the iron oxide added as mill scale. A temperature of 2700° to 3200°F. was explored.

### 19. Conversion of Calcium Ferrites in Magnesia Brick

By Lisle Hodnett: Canadian Refractories, Ltd., Montreal, Quebec, Canada

Silica added to lime-bearing magnesia materials during brick manufacture results in conversion of the ferrites into dicalcium silicate with the iron oxide released and absorbed by the magnesia. The amount of ferrite converted is proportional to the amount of silica added. Addition of more than the theoretical amount required results in the formation of magnesia-bearing orthosilicates such as merwinite or monticellite. Conversion of the ferrites within the large particles of clinker is complete, indicating that there is transference from around the large grains to the interior. Correction of the ferrites results in brick with increased refractoriness and with better burning properties.

### 20. Studies in the System $MgO$–$Al_2O_3$–$FeO$–$Cr_2O_3$

By Henry N. Baumann, Jr.: Research Department, The Carborundum Company, Niagara Falls, N. Y.

Various methods have been suggested and tried for modifying chromite for refractory uses. Natural chromite varies widely in chemical composition but is always made up chiefly of $MgO$, $Al_2O_3$, $FeO$, and $Cr_2O_3$, combined as a member of an isomorphous spinel series. The problem of modifying chromite by chemical and thermal treatment therefore involves a knowledge of the system $MgO$–$Al_2O_3$–$FeO$–$Cr_2O_3$. This study concerns chiefly the effect of acid oxides on the primary crystallization of that portion of the system high in alumina.

### 21. High-Temperature Torsional Study of Some Silicon Carbide Bodies

By R. K. Hursh: Department of Ceramic Engineering, University of Illinois, Urbana, Ill.; and V. D. Frechette: Corning Glass Works, Corning, N. Y.

A simple apparatus for the study of materials under torsional stress at high temperatures is described and series of values for modulus of rigidity and rate of distortion under constant loading at temperatures up to 1350°C. are presented for several silicon carbide bodies.

### 22. Substitution of Topaz, Domestic Kyanite, and Synthetic Mullite-Corundum for India Kyanite: IV, Raw Topaz as a High-Temperature Bond for Domestic Kyanite

By T. N. McVay: Southern Experiment Station, U. S. Bureau of Mines, Tuscaloosa, Ala.; and W. W. Galbreath, Jr., and Dan Allen: Electrotechnical Laboratory, U. S. Bureau of Mines, Norris, Tenn.

Raw topaz has been found to act as a high-temperature bond for both raw and calcined kyanite. This bonding action is thought to be due in part to volatiles which emerge from the raw topaz between 1000° and 1200°C. Some of the topaz decomposition products are retained by the calcined kyanite. Within the limits of this investigation, all refractories which contained either calcined or raw kyanite or mixtures of the two, with a minimum of 10% of raw topaz had a good structure and were well bonded. The results of the load tests indicated that increased firing temperature in the preheat improved the load resistance, but excellent high-temperature resistance was obtained by preheating as low as 1300°C. in laboratory kilns.

## Supplementary Titles

### 23. Spalling of Fire-Clay Brick in Panels of Header and Stretcher Construction

By R. A. Heindl and W. L. Pendergast: National Bureau of Standards, Washington, D. C.

Sixteen brands of superduty class of firebrick, twenty-eight of the high-heat, and six of the intermediate-heat variety were investigated for resistance to spalling by the A.S.T.M. panel method. The method was varied by constructing the panels in three different ways, namely, the brick were laid as (1) all headers, (2) all stretchers, and (3) a combination of stretchers and headers. The relation between pressure in the furnace during the 24-hour reheating period and the spalling resistance was also studied. Pyrometric cone equivalents for all brands and the constancy of volume of the superclass of firebrick after heating at 1600°C. are included in the report.

### 24. Reaction Zones in High-Magnesia Roof Brick from a Copper Reverberatory Furnace

By A. T. Prince: Canadian Refractories, Limited, Montreal, Quebec, Canada

A brief description is presented of the type of installation and the metallurgy in the reverberatory furnace. The appearance of the brick after service in the roof of the furnace is described and their chemical composition is given. A petrographic examination of thin sections and powder mounts of the various reaction zones were made. Certain conclusions are drawn from the data obtained relating to the chemical corrosion of magnesia refractories.

# STRUCTURAL CLAY PRODUCTS DIVISION PROGRAM

**Chairman:** L. R. Whitaker, Carolina Ceramics, Incorporated, Columbia, S. C.
**Secretary:** R. L. Stone, Department of Ceramic Engineering, University of North Carolina, Raleigh, N. C.

**Program Committee**
V. W. Boeker, Chairman, Owens-Corning Fiberglas Corporation, Toledo, Ohio
A. C. Jackson, Claycraft Company, Columbus, Ohio
H. K. Lynn, Summitville Face Brick Company, Summitville, Ohio

**Hotel William Penn: Silver Room**

**Tuesday Forenoon, April 4, 1944: 9:00 A.M.–12:00 M.**

### 1. Splitting of Soft-Mud Brick

By H. G. Schurecht and J. F. McMahon: Ceramic Experiment Station, New York State College of Ceramics, Alfred, N. Y.

An interesting case of brick splitting was studied. The splitting, which was parallel to the width and length of the brick, was found to be associated with carbon coloring. An explanation dependent on the different expansions of various portions of the brick is advanced. Oxidation tests were run to determine the effect of fineness of added combustibles and the effect of various clays and sands on the time necessary to burn out all of the combustible material.

### 2. Welded Steel Clay-Product Machinery

By E. A. Hawk: Hawk Laboratories, North Georgetown, Ohio

### 3. Modular Masonry Design

By Harry C. Plummer: Structural Clay Products Institute, 1756 K Street, N. W., Washington, D. C.

### 4. X-Ray Photographs of Ceramic Materials and Products

By C. J. Woods: North American Philips Company, Inc., 100 East 42nd St., New York 17, N. Y.

X-ray photographs of ceramic ware will be shown and complete findings and analyses of these products will be presented. Literature on the use of the apparatus will be available.

**Structural Clay Products Division Luncheon and Business Meeting**

**Silver Room**

**Tuesday Noon, April 4, 1944: 12:30 P.M.–2:00 P.M.**

## STRUCTURAL CLAY PRODUCTS DIVISION PROGRAM (continued)

### Silver Room

**Tuesday Afternoon, April 4, 1944: 2:00 P.M.–4:30 P.M.**

#### 5. Improved Design of Continuous Operation for the Heavy Clay Industry

By JOHN H. ISENHOUR: Isenhour Brick & Tile Company, Salisbury, N. C.

A plant is described that is designed to produce brick and tile by continuous operation for off-bearing to the drier and from the drier to the kiln with no labor handling of the product. The entire drying and firing process is carried on in small continuous units which are synchronized with the machine production. Brick and tile that are made by this method are completely processed in eight hours or less.

#### 6. Material Handling Methods

By E. W. CLARK: Clark Equipment Company, Battle Creek, Mich.

The paper will show that unskilled labor adds nothing to a product except costs. Methods of reducing unskilled labor to a minimum are developed.

#### 7. Revolutionary Continuous Plant for Clay Products

By CHARLES ISENHOUR: Armour Research Laboratory, Chicago, Ill.

The design of a complete plant in which no drier or kiln cars are required is presented. Products move from forming machinery to kiln by a complete mechanical handling system. Products are fired in a period of only a few hours.

#### 8. Structural Tile Production

By W. B. FRASER: Fraser Brick Company, Dallas, Texas

The methods and problems of producing vertical cell tile and smooth surface tile are discussed. During recent production, drying losses have increased, and the quality of the smooth-faced ware has fallen below trade requirements. The clay being used is very fine grained, has a moisture content of 16% at the pit, fires to a pale red at 1800°F., and has a fired absorption of 10 to 12% on the 24-hour cold-water immersion test. The clay is prepared by passing it through a granulator, a disintegrator, conical rolls, and finally through high-speed smooth rolls. The clay is tempered in a 12-ft. pug mill, passes through a combination pug mill and auger machine; it is then deaired and extruded in deaired form. The ware is dried in about 24 hours in a Proctor, humidity-controlled steam drier. Drying shrinkage averages about 6%. The ware is fired with natural gas of 1000 B.t.u. value in a continuous kiln. Maximum firing shrinkage is about 1%. Monthly production is about 3000 tons.

Two problems for discussion are presented. (1) The moisture content and nature of the clay do not permit economical grinding direct from the pit either in dry-pan or hammer-mill grinders and the clay cannot be satisfactorily screened until it is fairly dry, which presents the problem of suitable preparation to permit screening. (2) The second problem is reduction of drying losses. The possibilities of using a rotary drier are being considered. The costs of predrying are not prohibitive, but by predrying to 400°F., the character of the clay is changed and drying conditions are somewhat improved. Tests are now being conducted in predrying the clay to a maximum temperature of 800°F,. but in such a manner that 25% of the clay will be affected at this temperature and the remainder by variations of temperature down to 400°F. No admixture of raw clay would be necessary.

### General Luncheon—Ball Room

**Wednesday Noon, April 5, 1944: 12:30 P.M.–2:00 P.M.**

**Address: Eighteenth Century English and Irish Glass**

**By Douglas C. Carson: Steuben Glass, Incorporated, New York, N. Y.**

## STRUCTURAL CLAY PRODUCTS DIVISION PROGRAM (continued)

**Silver Room**

**Wednesday Forenoon, April 5, 1944: 9:00 A.M.–12:00 M.**

### Symposium on "Postwar Considerations for the Structural Clay Products Industry"

**Chairman: L. R. Whitaker**

**9. Future of the Structural Clay Products Industry**

By L. R. Whitaker: Carolina Ceramics, Incorporated, Columbia, S. C.

**10. Structural Clay Products Research Objectives**

By R. K. Hursh: Department of Ceramic Engineering, University of Illinois, Urbana, Ill.

**11. Tolerance Requirements for Postwar Markets**

By Fred L. Steinhoff: Industrial Publications, Incorporated, 59 East Van Buren St., Chicago, Ill.

**12. Design Suggestions for Structural Clay Products**

By Frederick Heath, Jr.: Owens-Corning Fiberglas Corporation, Toledo, Ohio

**13. Sponge Iron, a Product of Structural Clay Products Plants**

By C. P. Austin: Binghamton Brick Company, Binghamton, N. Y.

**14. Cellular Clay, a New Structural Material**

By E. F. Theobald: Metropolitan Paving Brick Company, Canton, Ohio

## STRUCTURAL CLAY PRODUCTS DIVISION PROGRAM (concluded)

**Silver Room**

**Wednesday Afternoon, April 5, 1944: 2:00 P.M.–4:30 P.M.**

### Symposium on "Postwar Considerations for the Structural Clay Products Industry" (concluded)

**15. Glazed Products for Postwar Construction**

By A. C. Jackson: Claycraft Company, P. O. Box 866, Columbus, Ohio

**16. Postwar Production Equipment and Methods**

By Charles E. Bates: National Fireproofing Company, Pittsburgh, Pa.

**17. Postwar Handling Equipment and Methods**

By E. B. Merry, Jr.: Merry Brothers Brick and Tile Company, Augusta, Ga.

**18. Postwar Firing Equipment and Methods**

By George D. Brush: Harrop Ceramic Service Company, Columbus, Ohio

# WHITE WARES DIVISION PROGRAM

**Chairman:** J. R. Beam, Universal Sanitary Manufacturing Company, New Castle, Pa.
**Secretary:** J. W. Whittemore, Virginia Polytechnic Institute, Blacksburg, Va.

**Program Committee**
C. M. Lambe, Jr., Chairman, University of North Carolina, Raleigh Unit, Raleigh, N. C.
E. P. McNamara, Department of Ceramics, Rutgers University, New Brunswick, N. J.

**Hotel William Penn: Ball Room**

**Tuesday Forenoon, April 4, 1944: 9:00 A.M.–12:00 M.**

## Ball Clay Investigation: Symposium III

**Chairman: Ralston Russell, Jr., Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.**

### (1) Discussion of Objectives

The aims and purposes of the Symposium will be clarified and unified; various proposed methods of accomplishing these objectives will be discussed.

(*a*) F. H. Norton and A. L. Johnson: Division of Ceramics, Massachusetts Institute of Technology, Cambridge 39, Mass.
(*b*) F. P. Hall: Onondaga Pottery Company, Syracuse, N. Y.
(*c*) Hewitt Wilson: Electrotechnical Laboratory, U. S. Bureau of Mines, Norris, Tenn.

### (2) Fellowship Proposal

By Ralston Russell, Jr.

The Chairman will present a general survey of the industry made to determine the possibility and desirability of sponsoring a joint fellowship plan to expedite progress on ball-clay studies. A discussion will follow this report.

### (3) Organization of a Project Designed to Promote Standardization

By G. A. Bole: Engineering Experiment Station, Ohio State University, Columbus 10, Ohio

By way of comparison with this project, the methods used by the A.S.T.M. in establishing standard tests and procedures will be discussed and difficulties which may be encountered will be pointed out.

### (4) Variation in Plastic Character of Different Ball Clays

By A. S. Watts: Department of Ceramic Engineering, Ohio State University, Columbus 10, Ohio

### (5) Ball-Clay Test Methods in Current Use

By C. M. Lambe, Jr., Department of Ceramic Engineering, University of North Carolina, Raleigh Unit, Raleigh, N. C.

An analysis will be presented of a survey made by the Chairman to ascertain the methods used by the industry in testing ball clays. Several reports will be given to indicate the typical procedures now in use by producers and manufacturers in testing and controlling ball clays.

(*a*) C. W. Hall: United Clay Mines, Corporation, Trenton, N. J.
(*b*) R. C. Meeker: Kentucky-Tennessee Clay Company, Alliance, Ohio
(*c*) J. R. Beam: Universal Sanitary Manufacturing Company, New Castle, Pa.
(*d*) Hewitt Wilson: Norris, Tenn.

### (6) Tentative Standards

Tentative Standards as proposed by members of the Ball Clay Research Committee will be discussed from the viewpoint of suggestions given at a previous Symposium.

(*a*) Mine vs. Plant Selection
By James R. Beam
(*b*) Physical Form of Clay Samples
By L. E. Thiess: General Electric Company, Schenectady, N. Y.
(*c*) Wet Clay vs. Dry Clay; Drying Procedures; Storage and Distribution of Samples
By R. E. Gould: Buffalo Pottery, Incorporated, Buffalo 10, N. Y.
(*d*) Clay vs. Clay-Flint vs. Standard Body Mixtures
By A. J. Hedquist: Taylor, Smith, and Taylor Company, Chester, W. Va.
(*e*) Choice of Standard Materials, Water Selection, and Compensation for Moisture in Materials
By H. Thiemecke: Homer Laughlin China Company, Newell, W. Va.
(*f*) Batch Preparation; Aging
By Edward Schramm: Onondaga Pottery Company, Syracuse, N. Y.
(*g*) Plastic Extrusion vs. Hand Wedging; Deairing
By J. W. Whittemore: Virginia Polytechnic Institute, Blacksburg, Va.
(*h*) Standardization of Moisture Content for Molding; Method of Determination
By Sidney Speil: Electrotechnical Laboratory, U. S. Bureau of Mines, Norris, Tenn.
(*i*) Specimen Drying Procedure; Storage of Specimens
By V. J. Roehm: Kentucky Clay Mining Company, Alliance, Ohio
(*j*) Rate of Drying Tests; Drying Characteristics (Cracking, Warping, Discoloration); Drying Shrinkage; Dry Transverse Strength
By A. S. Watts: Department of Ceramic Engineering, Ohio State University, Columbus 10, Ohio
(*k*) Soluble Salt Determinations
By K. C. McCartt: Universal Sanitary Manufacturing Company, New Castle, Pa.

### (7) Subcommittees and Appointments

Committees will be assigned to consider various individual problems and methods of testing.

**White Wares Division Luncheon and Business Meeting**

**Ball Room**

**Tuesday Noon, April 4, 1944: 12:30 P.M.–2:00 P.M.**

## WHITE WARES DIVISION PROGRAM (continued)

**Ball Room**

**Tuesday Afternoon, April 4, 1944: 2:00 P.M.–4:30 P.M.**

### 1. Casting Characteristics of Clays: II, Properties of Individual Clays

By R. Russell, Jr., and W. C. Mohr: Research Laboratories, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

A report is given on the properties of thirteen kaolins and nine ball clays mixed with equal parts of flint. Domestic clays were used in all except one case. The casting properties determined included fluidity, permeability, casting time, water retention, thixotropy, organic content, dry and fired shrinkage and strength, and fired absorption. Comparisons are made to indicate the desirable characteristics of the different clays, and a selection is made of the most promising clays for subsequent body tests.

### 2. Casting Characteristics of Clays: III, Selective Design of Body Composition

By R. Russell, Jr., W. C. Mohr, and H. H. Rice

Six kaolins and five ball clays, selected as promising from the results of previous studies, were used in various combinations in the preparation of all-domestic body mixtures. Tests were conducted to determine the casting characteristics and the dry and fired (cone 12) properties. An analysis was made to determine the effect of individual clays on the properties of composite bodies. The possibilities for the selective design of casting bodies based on the properties of individual clays are discussed.

### 3. Account of an Efficient Modulus of Rupture Machine

By G. W. Phelps: United Clay Mines Corporation, Trenton, N. J.

A description is given of an inexpensive but reliable modulus of rupture testing machine. The simplified calculation procedure is described with a time study of the old methods as compared with the new. Drawings of the machine will be shown.

### 4. Effect of Exchangeable Cations on the Hydrophilic Nature of Kaolin and Bentonite

By A. C. Siefert and E. C. Henry: Department of Ceramics, Pennsylvania State College, State College, Pa.

The affinity for water of a kaolinite-type clay (kaolin) and a montmorillonite-type clay (bentonite), saturated with hydrogen, calcium, sodium, and potassium, was studied by three methods, namely, heat of wetting as determined by calorimetric measurements, sorption of water from the vapor phase by weighing, and desorption of water by differential thermal analysis. Hydrogen and calcium clays are shown to have a greater affinity for water than sodium and potassium clays. The bentonite evolved less heat and sorbed less water per milliequivalent of exchangeable cation than the kaolin; the differences in the effects of various cations were less pronounced in kaolin than in bentonite. The results may be explained in two ways from a consideration of the mineral structures, (1) a greater amount of water hydrates the surface of kaolinite in proportion to that hydrating the exchangeable cations than is the case in montmorillonite and (2) the exchangeable cations may be hydrated to a greater degree (i.e., less strongly held) in kaolinite than in montmorillonite.

### 5. Fundamental Study of Clay: VI, Flow Properties of Kaolinite-Water Suspensions

By F. H. Norton, A. L. Johnson, and W. G. Lawrence: Division of Ceramics, Massachusetts Institute of Technology, Cambridge 39, Mass.

The flow properties of six monodisperse kaolinite fractions were studied over a wide range of concentration. From these results, it has been possible to set up an equation relating viscosity to concentration which holds over a very wide range. Equations relating concentration to thixotropy and the yield point which have general application may also be established. The viscosity of a suspension is obtained from the sum of three quantities, namely, that contributed by (1) the liquid, (2) the individual particle, and (3) the collisions of the particles. Thixotropy is found to be due to the sum of two quantities, namely, the contribution of (1) the individual particle and (2) the interference of the particles. The yield point in these fractions was found to be proportional to the cube of the concentration. With these relations, it is possible to calculate the viscosity of a casting slip for any change in specific gravity.

(No. V of this series is listed as No. 19.)

### 6. Cataphoresis of Purified, Fractionated Kaolinite Particles

By W. L. Coughanour and J. L. Utter: Division of Ceramics, Massachusetts Institute of Technology, Cambridge 39, Mass.

The cataphoretic velocity of three purified, monodisperse fractions of Florida kaolin was determined by the ultramicroscope method. The effect of particle size, kaolinite concentration, and electrolyte concentration on the migration velocity of the particles was observed. Calculations of zeta potential, charge density, and total charge were made for the various systems. It is shown that the zeta potential decreases with increasing particle size and increasing clay concentration. The plots of migration velocity vs. electrolyte concentration follow the usual form for such curves, rising rapidly with the first electrolyte additions and flattening out as equilibrium is reached.

## WHITE WARES DIVISION PROGRAM (continued)

### Ball Room

**Wednesday Forenoon, April 5, 1944: 9:00 A.M.–12:00 M.**

**7. Designer and Technologist Share a Common Interest in American Dinnerware Production**

By Vincent Broomhall: Edwin M. Knowles China Company, East Liverpool, Ohio

**8. Effect of Addition of Diopside on Properties of a Wall-Tile Body (Progress Report)**

By C. R. Amberg: New York State College of Ceramics, Department of Research, Alfred, N. Y.

This report on the study of New York State diopside ($CaO \cdot MgO \cdot 2SiO_2$) describes its use in ceramic products. The effect of substitutions of the mineral for talc and feldspar on the firing characteristics, refractoriness, thermal expansion, and moisture expansion of a wall-tile body is described.

**9. Notes on Moisture Expansion**

By H. Thiemecke: Homer Laughlin China Company, Newell, W. Va.

Data on the moisture expansion of several types of semivitreous and vitreous bodies, bisque and glazed, after treatment under varying conditions are presented. The treatment included autoclaving at 100 lb. pressure for three hours, exposure to air, distilled water submersion, and holding in a sulfuric acid desiccated atmosphere, the latter three conditions for a three-year period.

**10. Suggestions for Solution of Difficult Glaze-Fit Problems**

By C. G. Harman: Department of Ceramic Engineering, University of Illinois, Urbana, Ill.

Methods and principles by means of which suitable glazes for special purposes may be prepared are discussed, including examples of glazes for low-expansion bodies and durable low-temperature glazes.

**11. Glost Kiln Refractories**

By Edward Schramm: Onondaga Pottery Company, Syracuse, N. Y.

In saggers and other refractories used in glost placing, it is necessary to consider not only their life and performance as refractories but also their effect on the product. Such faults as kiln dirt and pin chipping are directly influenced by the refractories used. These process requirements take precedence over the simpler problem of securing long life in the refractories themselves.

**12. Effect of Ceramic Deflocculents on Physical Properties of Pottery Plaster Molds**

By L. E. Cunningham: United States Gypsum Company, Research Laboratories, 1253 Diversey Parkway, Chicago, Ill.

Two-inch cubes of set and dried pottery plaster were immersed for six hours in 1% solutions of sodium carbonate, sodium silicate, tetrasodium pyrophosphate, ammonium tartrate, and distilled water. The cubes were then removed, rinsed, and dried to constant weight. This cycle was repeated 10 times, employing fresh solutions for each subsequent immersion. Tests and observations were made on the cubes (*a*) as cast, (*b*) after 5 immersion cycles, and (*c*) after 10 immersion cycles for (1) surface appearance, (2) weight loss, (3) compressive strength, (4) surface hardness, (5) drying rate, (6) absorption rate, and (7) susceptibility to calcination.

No positive recommendations can be given respecting preferred types of deflocculents for use with ceramic casting slips as far as action on plaster molds is concerned. Sodium carbonate accelerates mold-surface attack and decreases mold strength to a greater degree than other deflocculents. Tetrasodium pyrophosphate has an adverse effect on the rate of absorption, but this may not be serious if sufficient time can be allowed for formation of desired slip thickness on molds. Sodium silicate, pyrophosphate, and ammonium tartrate adversely affect the drying rate of molds. A suggested procedure is to employ the most efficient deflocculent in the lowest possible concentration to prolong mold life and to maintain desirable mold qualities.

**General Luncheon—Ball Room**

**Wednesday, April 5: 12:30 P.M.–2:00 P.M.**

**Address: Eighteenth Century English and Irish Glass**

**By Douglas C. Carson: Steuben Glass, Incorporated, New York, N. Y.**

## WHITE WARES DIVISION PROGRAM (concluded)

### Ball Room

**Wednesday Afternoon, April 5, 1944: 2:00 P.M.–4:30 P.M.**

**The Materials and Equipment Division Members will join in this session; Members of the Design Division will attend the presentation of the paper by Mr. Broomhall and afterward will return to the Forum Room for their own program.**

#### 13. Some Properties of Talc-Ball Clay Mixes

By J. F. McMahon: New York State College of Ceramics, Department of Research, Alfred, N. Y.

The shrinkage, electrical properties, and thermal expansion of various vitrified, talc-ball clay bodies were determined. New York State talc, untreated and beneficiated, is compared with a California material.

#### 14. Some Factors Involved in Shrinkage Control of Dry-Press Steatite Ware

By J. S. White: Stupakoff Ceramic & Manufacturing Company, Latrobe, Pa.

A study has been made of the effect of pressing pressure and pressing density on the vitrification and shrinkage of several steatite compositions.

#### 15. Simple Oxide Bodies

By R. F. Geller and P. J. Yavorsky: National Bureau of Standards, Washington, D. C.

Studies are described of various binary and ternary combinations of $ThO_2$–$ZrO_2$–BeO–$Al_2O_3$–$SiO_2$ and alkaline earth oxides heated under oxidizing conditions in an especially developed resistor-type furnace.

#### 16. Raw Leadless Whiteware Glazes

By C. G. Harman and Howard R. Swift: Department of Ceramic Engineering, University of Illinois, Urbana, Ill.

The popularity of lead-borosilicate glazes in the whiteware industries is due to their convenient maturing temperature, long maturing range, and good gloss. These advantages have been sufficient to outweigh some of the disadvantages of this type of glaze, the most outstanding of which are the presence of the poisonous lead in the batch, the volatility of the lead, and characteristic surface imperfections. Very promising raw leadless glazes are described, which show most of the advantages of the fritted lead type without the disadvantages characteristic of lead glazes.

#### 17. Influence of Humidity on Dielectric Properties of High-Frequency Ceramics

By Henry H. Hausner: General Ceramics and Steatite Corporation, Keasbey, N. J.

The dielectric properties of ceramics depend on composition, density, and surface conditions as well as many other factors. Humidity influences the dielectric properties to a large extent. These studies show that the amount of moisture depends on the compacting pressure and that the firing temperature has some influence on the dielectric properties in connection with relative humidity. Frequency and air pressure have an entirely different influence on the dielectric properties in relation to relative humidity.

#### 18. Ceramic Gauges of Abrasion-Resisting Compositions

By Robert Twells: Electric Auto-Lite Company, Auto-Lite Division, Fostoria, Ohio

Many parts that are being manufactured in large quantities for the Army and Navy must be made to extremely close tolerances. It is necessary in some cases to measure each part with a gauge. Because the tolerance which can be allowed for the wear of the gauge itself is small, the life of the gauge is often short. Ceramic gauges have been developed which are very hard and resistant to abrasion. Gauges made from corundum base bodies are being used in testing steel shell casings. The ceramic corundum gauge will measure approximately 150,000 pieces as compared to 15,000 with a steel gauge.

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### Supplementary Titles

#### 19. Fundamental Study of Clay: V, Nature of Water Film in Plastic Clay (*Jour. Amer. Ceram. Soc.*, **27** [3] 77–80 (1944))

By F. H. Norton and A. L. Johnson: Division of Ceramics, Massachusetts Institute of Technology, Cambridge 39, Mass.

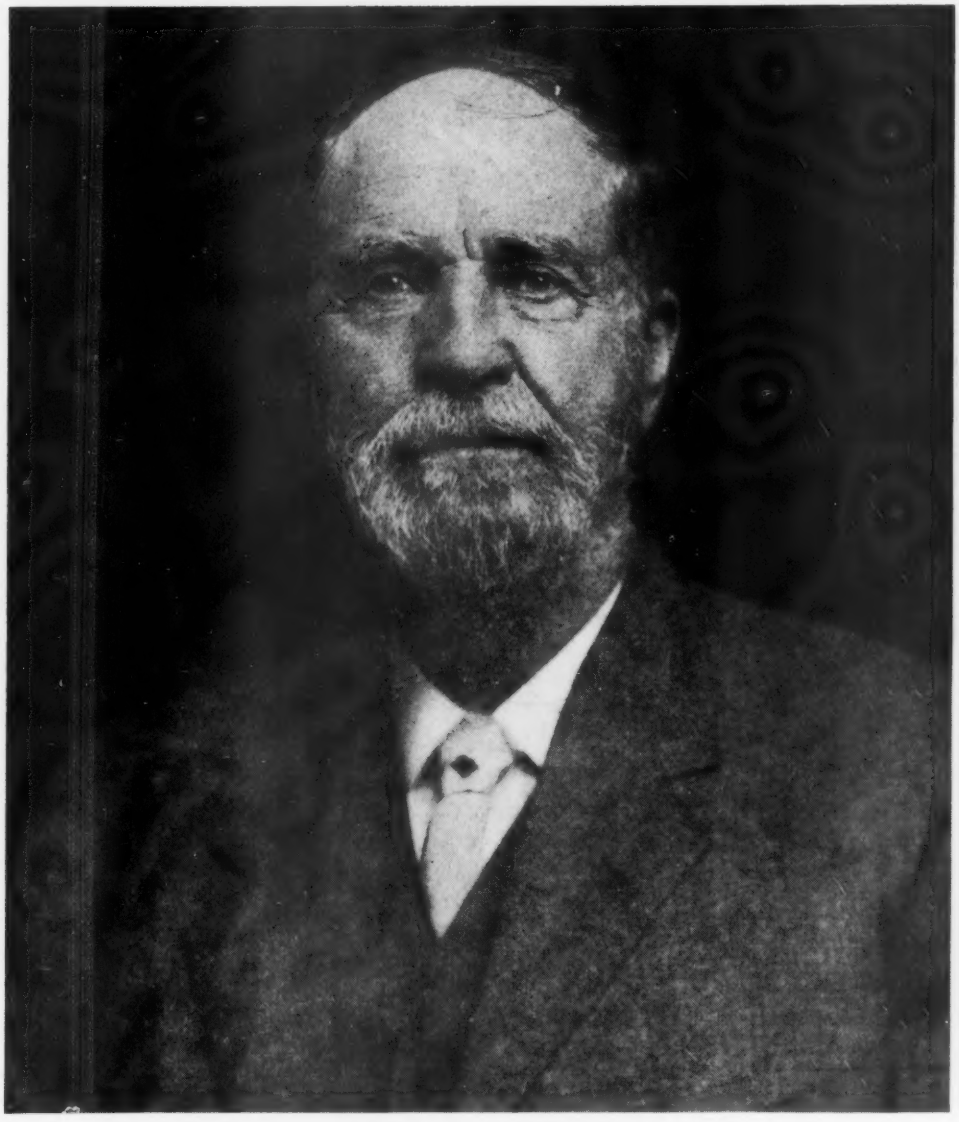
Using a pure monodisperse system of kaolinite particles of known diameter and thickness, it has been possible to calculate with a fair degree of precision the thickness of the water film separating the particles and the variation in thickness of this film for different pressures. It has also been possible to calculate with considerable certainty the force acting between two clay particles.

(No. VI of this series is listed as No. 5 for Tuesday afternoon.)

#### 20. Some Physical Properties Data on Ball Clays

By E. Joseph Weiss: Department of Ceramic Engineering, Ohio State University, Columbus, Ohio

# CERAMIC HISTORY



EDWARD RODGERS

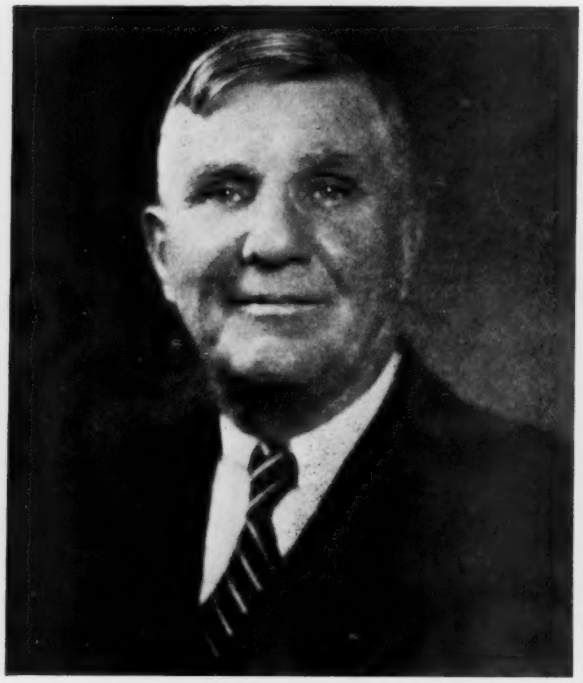
## RODGERS FAMILY IN THE BRICK BUSINESS

In 1890, the use of brick for paving was becoming very popular and some of the enterprising citizens of Alton, Illinois, interested in the development of the local resources, had some clay tested that had been used for some time by a small plant making pottery and roofing tile by hand.

This clay deposit was in an area adjoining the city where some of the first coal mines in Illinois were operated, and, on the strength of what seemed to be satisfactory test samples, stock was sold in the Alton Paving, Building and Fire Brick Company and a charter was issued July 2, 1892. Edward Rodgers, who previously had been school teacher, farmer, and fruit producer, subscribed to some of this stock as an investment. At the organization meeting, it was discovered that the matter of management of the Company had been somewhat overlooked. After much discussion, Edward Rodgers was induced to take over the office of president and general manager.

A plant of 70,000 daily capacity was built and put in

operation in the spring of 1893, the plant consisting of grinding and forming machinery, a steam drier, and ten large rectangular kilns. Eben Rodgers, son of Edward Rodgers, at that time a student at the University of North Carolina, contributed to the construction of this plant during the summer of 1892 by hauling sawdust from a neighboring sawmill for insulating the walls of the steam drier.



**Eben Rodgers, Sr.**

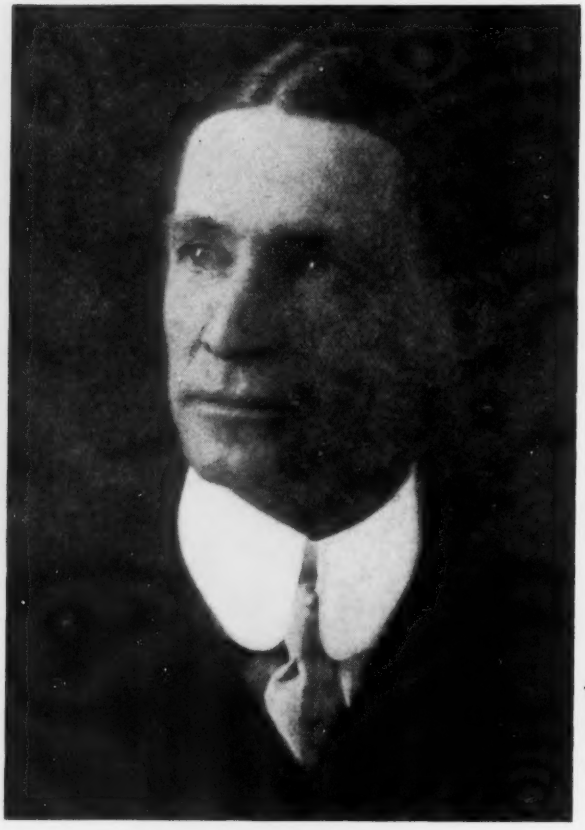
After the plant was in production, it was found that the material from which pottery and roofing tile had been made and from which some good-looking test samples were displayed was too brittle for the best paving use. Fortunately on this property were found previously unknown deposits of several kinds of shale and some fire clay. First-class pavers were made from these shales and later a full line of red and buff face brick and hollow tile was produced from mixtures of the various deposits.

In June, 1893, Eben Rodgers was elected secretary of the Company.

In 1895, it was found necessary to produce a face brick to use with the off-grade pavers for building purposes. The building market in this area was almost exclusively dry press. A six-mold dry press was installed and the kiln capacity was increased to handle this production.

About this time, a salesman of the Dry Press Machinery Company located deposits of various grades of shale and fire clay in the southeast corner of New Mexico across the Rio Grande River from El Paso, Texas. A brick plant was promoted and dry-press machinery was installed. A loan was negotiated from Edward Rodgers to assist in completing this plant and expanding the dry-press machinery plant in St. Louis.

In 1898, Edward Hewitt Rodgers, second son of Edward Rodgers, after graduating from business college, was sent to El Paso. In the long run, it became necessary for Edward Rodgers to take over both the machinery plant and the El Paso plant to protect the loans he had made. The machinery plant, under the management of William L. Rodgers, a nephew of Edward Rodgers, made dry presses and did a general machine-shop business until 1942, when the entire mechanical equipment was sold to a subsidiary of the General Motors Corporation for use in war work. Edward Hewitt Rodgers is now sole owner of the El Paso Brick Company, which is making common brick, red and buff face brick, firebrick, and hollow building tile.



**E. Hewitt Rodgers**

The name of the Alton Paving, Building and Fire Brick Company was found to be rather cumbersome, so it was changed to the Alton Brick Company in 1908.

In 1911, a paving-brick plant in St. Louis County, Missouri, which had been in the hands of a receiver, was purchased and changed over to a high-grade textured shale brick plant.

On the death of Edward Rodgers in 1921, Eben Rodgers was elected president.

In 1923, a paving-brick plant in Edwardsville, Illinois, in the hands of a receiver, was purchased and operated as a part paving-brick and part shale face-brick plant.

In 1925, a small common-brick plant about twelve miles west of Alton was purchased.

These four plants were operated for several years and supplied a large market for textured shale brick throughout the Middle West. To simplify the labor and management problems, it was decided that the consolidation of effort

would be more efficient and economical. Between 1929 and 1935, the Alton and St. Louis County plants were modernized and the small common-brick and the Edwardsville plants were dismantled and the modern equipment of these plants was placed in the other two plants.

During this period, Eben Rodgers, Jr., who had been a student in the Ceramic Department at the University of Illinois and the Georgia School of Technology, installed a research and experimental department in the Alton plant

**Eben Rodgers, Jr.**

and in 1933 was elected vice-president in charge of production. The summer heat in this climate seemed to be detrimental to his health and in 1936 he was sent to San Francisco where a uniform cool climate prevails the year round and he immediately improved. Shortly after his arrival there he secured a position with the Owens-Illinois Pacific Coast Company, in connection with the construction of their new Oakland plant. He has been constantly employed by this Company since that time and now holds the title of personnel manager and is president of the Personnel Managers Council of San Francisco.

Rand Rodgers, second son of Eben Rodgers, upon graduating from Dartmouth College, entered the sales department of the St. Louis office and in 1937 was elected vice-president and supervisor of sales and production. In September, 1942, he received his appointment as lieutenant (j.g.) in the United States Navy and after a 60-day course in Boston was sent to Fort Lauderdale, Florida, where, as a now full lieutenant, he is skipper on one of the Y.P. ships operating out of that port.

Owing to the shortage of manpower and a restricted market, all production has ceased at both plants, but an effort is being made to modernize all equipment in every way to be in a position to meet the demand that will be made on the industry in the postwar period.

**Lt. H. Rand Rodgers**

**Eben Rodgers**

Eben Rodgers, president of the Alton Brick Company, is not only a leader in the clay industry, but his outside activities are numerous and varied. At the present time, he holds the offices of president of the Alton Park Commission; president of the Board of Trustees, Monticello College; member of the Board of Directors, Better Business Bureau, St. Louis; and member of the Executive Committee and director of the Alton Memorial Hospital.

In 1914, he was president of the National Brick Manufacturers Association and later president of the American Face Brick Association. He was also president of the Structural Clay Products Institute for four years (1937–1941).

He has been a member of The American Ceramic Society since 1920.

## CLAY SEGREGATION DEPARTMENT, ALTON BRICK COMPANY, SECURES RANGE OF COLORS IN FACE BRICK*

The wide-awake clay manufacturer finds he must keep step with the growing demand for variety in the color and shade of his product, particularly if it is to be used as a facing material. The Alton Brick Company, Alton, Illinois, with the knowledge that they had at hand a wonderful acreage of rich clay lands containing materials which, if properly blended, would give them an unusual range in color, decided to make the best possible use of them through proper segregation and processing.

If the firings were to give the exact quota of definite shades of brick, the material had to be controlled, so they built a raw-materials storage and segregation department of the highest order.

### Red Surface Clay

The plant is located two and one-half miles north of Alton, situated on a 265-acre tract of rich clay lands approximately 100 feet deep. There are 18 feet of red surface clay which is gathered by an electric shovel with a $1^1/_2$-yard dipper. The clay is taken to the bin house over an upper-level trestle in side-dump wooden cars by a $3^1/_2$-ton gasoline locomotive. The clay is dropped into an electrically driven rotary drier, which removes 10% of the weight of the clay in moisture. This drier is 5 by 60 feet in dimension. About 4% of the moisture is retained in the clay; a bone-dry clay is not desired. At the discharge end of the rotary drier, the clay drops into an elevator which takes it to the top of one of five 300-ton clay-storage bins.

The bin house is an all-steel-constructed building with galvanized corrugated steel siding and roof. The bins are round steel bins 20 feet in diameter and 20 feet high.

Below the surface clay is a 10- to 12-foot stratum of material which is stripped off with an electric shovel and discarded.

### Plastic Blue Shale

Directly underneath this undesirable material is an 18- to 20-foot stratum of plastic blue shale won by an electric shovel and transported to the plant in $4^1/_2$-yard side-dump cars by a 7-ton gasoline locomotive. This material is taken on a lower level into a small building housing a single roll crusher (21 by 42 inches), which crushes the material down to 3 inches and under. This crusher has a removable tooth and roll. A 25-horsepower motor drives the crusher and conveyer. Below the crusher is a 16-inch belt conveyer which carries the crushed clay to an elevator which elevates it 62 feet to the top of a 300-ton steel clay-storage bin. The elevators are steel enclosed with steel safety ladders on the outside and are driven by 5-horsepower motors. This material goes into the No. 1 bin and the surface clay goes into the No. 3 bin.

Directly under the soft blue shale is a 17- to 18-foot stratum of sandstone which is drilled by an electrically driven well drill, blasted down with dynamite and powder.

Directly under the sandstone is a 17- to 20-foot stratum of hard blue shale, peculiarly adapted to the manufacture of paving brick not being used at present.

Underneath this paving-brick material is a 32-inch vein of coal used for the rotary drier or in case of emergency at other points in the plant. The rotary-drier foundation rests on top of this vein of coal.

### Fire Clay

Underneath the coal is a 3- to 5-foot stratum of fire clay superimposing a 2- to 5-foot bed of limestone, below which is a 20-foot vein of a superior grade of fire clay. The upper eight feet of this fire clay has been opened up and they are mining it, using the limestone bed as a roof for mine entry.

The fire clay is obtained by the slope-mine method. There has been built a brick arch 54 feet long and 16 feet wide with a sump for a mine car which is loaded through an opening in the track level. Cars 33 inches high, with automatic bottom dumps, are used to load the skip car which nestles in the sump. This car holds 3 yards. It is drawn up the incline by a 45-horsepower electric hoist to the top of the crusher building where the clay is automatically dumped onto a grid over the storage bin which carries large lumps into a double roll crusher that reduces the fire clay to 3 inches and under. The crusher discharges directly into the storage bin below, which holds 40 tons of clay.

The bottom of the bin is equipped with duplex bin gates which discharge into $4^1/_2$-yard clay cars. These cars of clay are taken to the bin house by an 8-ton gasoline-driven locomotive.

At the bin house, the fire clay is brought into the corner of the building on a trestle under which is a storage hopper. An apron feeder in the bottom of the hopper feeds the clay into an elevator which takes it to the top of the last 300-ton steel bin where by means of a double spout the clay can be dropped into either the No. 4 or No. 5 bin. The extra bin has been built to serve for the storage of any new material that may be found in their clay mine which they may wish to handle separately.

### Accurate Mixing

Underneath the five storage bins, about 10 feet above floor level, are permanent steel tracks from which hang three portable weighing machines.

With the four grades of material to be handled and the great possibilities in varying shades by the use of different mixtures and the necessity of absolute control to keep the blended material in definite ratio, accurate measuring is an all-important matter.

Realizing how well the Richardson "Convey o Weigh" was performing this function for other industries requiring accurate weighing, they decided to use it.

The scale beams are controlled by a number of mercuroid switches as material passes over. Each machine is set for a definite weight of material, and this is automatically controlled in such a fashion that should any one of the three machines fail to weigh its proportion all of the machines are automatically shut off. If they are using a mixture of 30% sandstone, 50% fire clay, and 20% blue clay, this automatic control assures them of that definite portion throughout the operation.

From the Convey o Weigh, the measured material drops onto a 16-inch conveyer belt, 687 feet on centers, running on a troughing conveyer driven by a 15-horsepower motor

* Taken from "Making Brick at Alton," *Clay-Worker*, **92** [6] 417–27 (1929).

Just over the belt is hung a magnetic separator which extracts any tramp iron which might be in the clay.

Above the end of the apron feeder is a barium feeder from which barium carbonate is steadily dropped into the face-brick clay. About 1500 to 2000 pounds of barium are used daily. This is, of course, only for the face brick; no barium is used in the production of common brick, hollow tile, or paving brick. They much prefer to add the powdered barium to the clay previous to grinding so that it is mixed with the clay and sweats with the clay in storage, giving the maximum posssibility of thorough mixing.

**Plant Control Laboratory**

By a well-equipped laboratory, the Company has insured itself against trouble through lack of knowledge of the material by setting up a miniature plant, the equipment of which duplicates the operation of the plant proper.

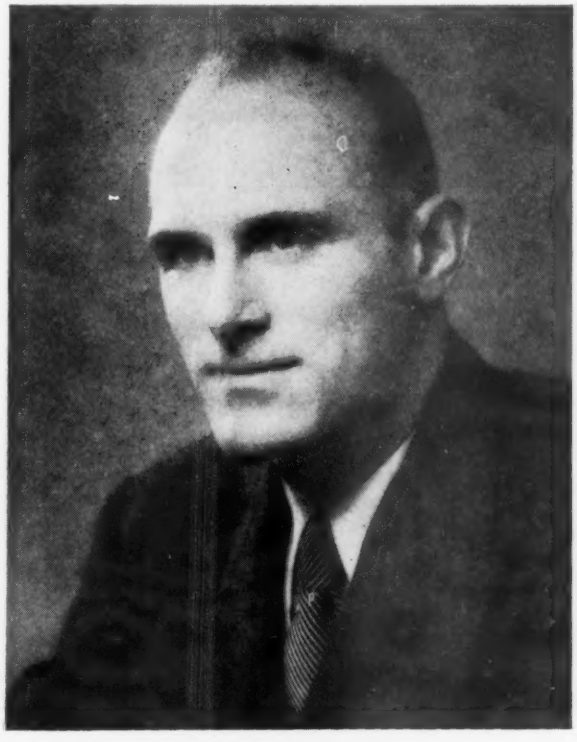
The machinery of this laboratory plant consists of a 5-foot dry or wet pan, an elevator, a screen, a storage tank, a pug mill and brick machine, and a small hand cutter. There is also equipment for physical and chemical tests—a dry oven, a direct motor-driven ball mill, a pulverizer, and the usual nested screens, laboratory benches, scales, etc. The work in this laboratory gives them intimate knowledge of their material—has determined their mixtures and eliminated the experimental work on the plant proper while in operation. Lyman R. Squier is in charge of this work.

# OUR WAR CONFERENCE SPEAKERS

## J. GORDON LIPPINCOTT

SUBJECT: "Industrial Design and Creative Postwar Thinking in the Glass, Clay, and Enamel Industries."

J. Gordon Lippincott, consultant industrial designer with Dohner & Lippincott, New York, N. Y., was graduated with high honors from Swarthmore College, Swarthmore, Pa. (B.S. degree) and received the M.S. degree in engineering and architecture from Columbia University, New York, N. Y.



**J. Gordon Lippincott**

He studied with Frank Lloyd Wright in Taliesin, Wis., spent three years studying arts and architecture in Europe, and was associated for seven years with Pratt Institute, Brooklyn, N. Y., as director of product development in the Department of Industrial Design. He was also consultant and lecturer with the Plastics Industries Technical Institute, New York, N. Y.

He has been a consultant industrial designer with his own staff for the past eight years.

The following is a partial list of companies for whom Mr. Lippincott has done consultant design, engineering, or merchandising:

American Agricultural Chemical Co., New York, N. Y.; Allied Products, Inc., New York, N. Y.; Allbright Electric Co., New York, N. Y.; Bell Telephone Laboratories, New York, N. Y.; Bridgeport Moulded Products, Inc., Bridgeport, Conn.; Conrad Razor Blade Co., Long Island City, N. Y.; Cowan & Dengler, New York, N. Y.; Dictograph Sales Corp., New York, N. Y.; Dufaycolor, Inc., New York, N.Y.; Dunlop Tire & Rubber Co., New York, N. Y.; Emerson Radio & Phonograph Corp., New York, N. Y.; Feigenspan Brewing Co., Newark, N. J.; Florence Stove Co., Gardner, Mass.; Dentist's Supply Co., New York, N. Y.; General Electric Co., Schenectady, N. Y.; H. J. Heinz Co., Pittsburgh, Pa.; Hygrade Sylvania Corp., Ipswitch, Mass.; Johnson & Johnson, New Brunswick, N. J.; Keith Clark, Inc., New York, N. Y.; Kinney Mfg. Co., Boston, Mass.; Life Saver Corp., Port Chester, N. Y.; Lorr Laboratories, Paterson, N. J.; Murray Switch Co., Brooklyn, N. Y.; Holophane Co., New York, N. Y.; New Haven Clock Co., New Haven, Conn.; Northam Warren Corp., Stamford, Conn.; North American Philips Co., New York, N. Y.; Krueger Brewing Co., Newark, N. J.; Philco Radio & Television Corp., Philadelphia, Pa.; Park & Tilford, Inc., New York, N. Y.; Pepsi Cola Co., Long Island City, N. Y.; F. G. Heublein & Bros., Hartford, Conn.; Reinhold Publishing Co., New York, N. Y.; Remington Arms Co., Bridgeport, Conn.; Scott Paper Co., Chester, Pa.; Seagrams Distillers Corp., New York, N. Y.; Rolls Razor, Inc., New York, N. Y.; G. Washington Coffee Refining Co., Morris Plains, N. J.; Westinghouse Electric & Mfg. Co., Pittsburgh, Pa.; Western Electric Co., New York, N. Y.; Zonite Products Corp., New York, N. Y.; Automotive Maintenance Machinery Co., Chicago, Ill.; Castaloy Corp., Detroit, Mich.; Sterling Plastics Co., Union, N. J.; Victor Electric Co., Cincinnati, Ohio; and Consolidated Molded Products Corp., Scranton, Pa.

In working with these companies Mr. Lippincott has dealt with substantially all phases of product development, from the creation of new product ideas through design and engineering detailing to packaging, display, and merchandising. He has used all basic materials, viz., steel, aluminum, brass, ceramics, glass, plastics, wood, textiles, and paper. These have been combined with a knowledge of basic processes, such as metal stamping, welding, forging, die casting, molding, extruding, plating, painting, laminating, and wood fabrication.

## EDWIN F. BORDEN

SUBJECT: "Wage Incentives."

Edwin F. Borden, general manager of The Douglas T.

Sterling Co., Stamford, Conn., spent four years after the last war in actual machine-shop work. Part of this time he attended a training course instituted by the International Motor Company, manufacturers of Mack trucks. Following this, he became associated with Lybrand, Ross Brothers & Montgomery, public accountants of New York, N. Y., for about seven years, and for two years he was comptroller of the National Forge and Ordnance Co., Warren, Pa.

From that point to the present time, Mr. Borden has been engaged in industrial engineering, progressively as installation engineer, supervisor, assistant chief engineer, chief engineer, and present partner and general manager of The Douglas T. Sterling Company and Dohner & Lippincott, New York, N. Y. During this time, he either installed or supervised the installation of such items as plant layout, wage incentives, job evaluation, material and production control, and cost-accounting installations in more than seven hundred plants in all portions of the United States. Also during this time, he took over, on a professional basis, the actual management of five different businesses during the depression years and put them on a paying basis.

## ROBERT AUGUSTUS WEAVER

**Robert Augustus Weaver, President, Ferro Enamel Corp., Cleveland, Ohio. Subject: "Postwar Enamel Industry."**

For biographical sketch, see *Bull. Amer. Ceram. Soc.*, **21** [7] 121–22 (1942).

## JOHN A. STEPHENS

SUBJECT: "Industry Prepares for Peace."

John A. Stephens, vice-president, Industrial Relations, United States Steel Corporation of Delaware, Pittsburgh, Pa., and chairman for Allegheny County of the Committee for Economic Development, attended the public schools in Albany, N. Y., the place of his birth; entered Wesleyan University, Middletown, Conn.; and was graduated with an A.B. degree from Columbia University, New York, N. Y.

He joined the organization of the United States Steel Corporation of Delaware in 1938 as director of industrial relations and in February, 1942, was elected a member of the Board of Directors and the Executive Committee. He has held his present position since April, 1943.

He was previously president and director of the Bush-Terminal Company; president and director of the Celluloid Corporation; vice-president and director of the Thompson-Starrett Company, Inc.; president and director of Research, Inc.; vice-president and director of the Campbell Metal Window Corporation; and manager of industrial relations of the Chicago District for the Carnegie-Illinois Steel Corp., Chicago, Ill.

**John A. Stephens**

He served as a first lieutenant, captain, and major in the Field Artillery of the United States Army; as chairman of the Executive Committee of the New York City Emergency Work and Relief Administration; chairman of the Iron and Steel Division, Community Fund, Chicago, Ill., in 1936–1937; and president of the Industrial Relations Association of Chicago, Ill., in 1937–1938.

## JAMES FINNEY LINCOLN

SUBJECT: "Wage Incentives."

**Inventor, Engineer, and Administrator**

James Finney Lincoln, president of The Lincoln Electric Co., Cleveland, Ohio,* and the man in whose honor The James F. Lincoln Arc Welding Foundation was created, was born May 14, 1883, on a farm near Painesville, Ohio. His early life was greatly influenced by the necessity for frugality and the discipline of a family of three boys.

His academic training for the profession of electrical engineering was obtained at Ohio State University, Columbus, Ohio. He left school early in 1907 a few months before he was to graduate, a victim of the then-prevailing epidemic of typhoid fever. He was later awarded the degree of electrical engineer by the faculty. His two older brothers, Paul M. and John C. Lincoln, both hold the same degree from Ohio State University.

The character and mental stature of the man to be were evident during his life at the University. He was large

* Also director, Lincoln Electric Co. of Canada, Ltd., Leaside, Ontario; Lincoln Electric Co., Ltd., Welwyn Garden City, Herts, England; and Lincoln Electric Co. (Aust.) Pty, Ltd., Sydney, Australia.

and heavily muscled but, unlike many big men, he displayed a tempestuous emotional make-up which brought him devoted followers on the football field and served as a forecast of the way in which he would tackle the problems of life and of his profession.

His older brother, John C. Lincoln, had founded The Lincoln Electric Company and here is where James F. Lincoln went to work. It required five or six years for the strongly emotional youth to find himself. He finally did so by applying his tremendous energy and enthusiasm to the job of making the developments of electrical engineering useful to the public. That became a consuming passion with him and in following it he worked in the fields of invention, development, engineering, and, lately, the broader fields of economics and industrial management.

**James Finney Lincoln**

No estimate of the man is complete and no understanding of his career possible without recognition of his strong emotional nature and its fixation on making technical developments useful to people at large. Whenever and wherever he could find a way of doing a better job for less cost by application of engineering knowledge, the achievement of this end became a mission, a crusade, a task worthy of supreme effort.

In these uncertain times when thoughtful men of all professions are seeking a path to economic security, this man's achievements as an inventor, an engineer, and finally as an administrator are worthy of recognition.

Since 1929, the Company of which he is now president has more than tripled its number of employees by progressively, year after year through the depression, adding more employees as more work could be found for them. The Company has no bonded or bank indebtedness and is owned almost entirely by men active in its management and by its wage earners.

#### Technical Achievements

This happy state of affairs is due to James F. Lincoln's enthusiasm for applying technical achievements to useful purposes. Among his achievements are the following:

His first contact with electric arc welding was made when a 400-ampere arc-welding set sold for approximately $3000 or $4000 and its only known use was in repairing defective steel castings. He brought about the development of the separately excited direct-current arc-welding generator with bucking-series field and stabilizer in the arc circuit. This resulted in an arc characteristic which made it easy for an ordinary welding operator to learn how to weld. Mr. Lincoln then put a force of men in the field to show manufacturers how to use arc welding. As the market grew, other electrical manufacturers participated in the development. The present price of around $550 for a 400-ampere unit, which is better than the early units which sold for $3000 or $4000, is the result of applying technical knowledge to manufacturing problems and creating a demand for the equipment.

In the field of electric arc-welding electrodes, Mr. Lincoln pioneered in the development and application of shielded arc electrodes. Ten years ago, such an electrode was selling for roughly 20 cents per pound. Mr. Lincoln put machinery and equipment into his plant to make it, a research department to improve it, and today the product sells roughly at $5\frac{1}{2}$ cents per pound in carload lots. Again, in this field he put a force of men to show users how to obtain the utmost economies from the use of such electrodes.

In the field of automatic arc-welding equipment, Mr. Lincoln early recognized the coming need for speed and precision. He picked the carbon arc process as one susceptible to development in this direction. For a number of years, he spent substantial sums of money developing the equipment with little financial return. He developed a mechanism that would hold the arc to a predetermined length; a means of shielding the arc to give weld metal equal to and in many respects better than the steel to be welded; enveloping magnetic fields to stabilize the arc. In spite of administrative duties he went out and engineered the application of the equipment itself.

The process is today one of the most widely used in welding and is known as the Electronic Tornado.

In the field of induction motors, Mr. Lincoln brought about the following developments:

The use of squirrel-cage motors for elevators; the application of high-resistance rotor squirrel-cage induction motors to flywheel drives; and the use of welded steel in induction motor construction.

#### Author, Lecturer, and Patentee

Mr. Lincoln is the author of "An Industrialist Looks at 'The New Deal,'" "Tell the Truth and Keep Out of the Way," "Ignorance of the Law Is No Defense," "Who Can Employ the Idle?" "Intelligent Selfishness and Manufacturing," and many scientific and technical articles and papers.

He is also a well-known lecturer on all phases of welding as well as on economic and political subjects. He has lectured before many audiences the world over.

Among the United States patents issued to Mr. Lincoln are the following:

| | | |
|---|---|---|
| Pat.No. | 1,122,287 | "Charging Systems for Storage Batteries" |
| | 1,224,307 | "Arc-Welding Apparatus" |
| | 1,234,678 | "Electric Switches" |
| | 1,260,218 | "Charging Systems for Storage Batteries" |
| | 1,329,532 | "Arc-Welding Apparatus" |
| | 1,373,621 | "Safety Charging Devices for Batteries" |
| | 1,485,120 | "Arc Welding" |
| | 1,553,543 | "Arc Welding" |
| | 1,604,180 | "Arc Welding" |
| | 1,604,181 | "Arc Welding" |
| | 1,629,876 | "End Frame Ring for Motors" |
| | 1,629,877 | "Frames for Dynamo Electric Machines" |
| | 1,774,023 | "Arc Welding" (reissued into No. 18,221) |

| | |
|---|---|
| 1,784,102 | "Dynamo Electric Machines" |
| 1,819,182 | "Dynamo Electric Machines" |
| 1,826,355 | "Arc Welding" |
| 1,827,245 | "Arc Welding" |
| 1,917,531 | "Arc-Welding Apparatus" |
| 1,918,763 | "Dynamo Electric Machines" |
| 1,971,074 | "Current Generator for Arc Welding and the Like" |
| 2,070,949 | "Welding Current Generation" |

Many equivalents of the preceding patents have been granted by foreign countries.

**Philosopher**

Mr. Lincoln is widely known for his ability as a manufacturer and for his philosophy on management-worker relationship. This philosophy can perhaps be best expressed by quotations taken from some of his pamphlets and articles.

"A weak leader is afraid to develop those under him for fear they will surpass him. A strong leader knows that if he properly develops his associates he will be even stronger."

* * *

"The worker should be worthy of his hire, but his hire should be proportionate to his ability to produce."

* * *

"Leadership must lead."

* * *

"Wealth is created not by decree but by sweat, blood, and intelligence."

* * *

"To produce to the utmost requires the proper incentive."

* * *

"Man is inherently lazy; he must have the proper incentive to produce more than just enough to live."

* * *

"No man by himself can do great things, but he can inspire and encourage others to the point where the world will proclaim him a great leader."

* * *

"A man cannot be a really great boss without being a great leader."

* * *

"Any real leader is his own toughest critic."

* * *

"A leader's greatest job is to develop his followers."

* * *

"American industry leaves largely untapped its greatest resource—the productive power, initiative, and intelligence latent in every person."

* * *

"Management must be able to lead the organization in the direction of more efficient methods as fast as the method can be absorbed by the organization."

* * *

"Management and men are fellow workers. Neither is superior but each is responsible for their part."

* * *

"Management must be able to stand on its record and be accepted by all the workers as being fair, able, and intelligent."

* * *

"The goal of an organization must be this: to make a better and better product to be sold at a lower and lower price. Profit cannot be the goal. Profit must be a by-product."

* * *

"The way of the pioneer is hard but usually profitable."

"For an organization to succeed the worker must have confidence in management and management must have confidence in the worker."

* * *

"The interest of the worker, management, and owner or capital are identical."

* * *

"Selfishness is the motivating force of all human endeavor. Use it intelligently."

* * *

"Everything we do today is wrong. The only reason we do things the way we do is because we haven't been smart enough to find a better way."

* * *

"Incentive is the key to all progress."

* * *

"He who serves best will profit most."

* * *

"The future belongs to those who prepare for it."

* * *

"An organization to be successful must be expendable."

## MAJOR ALBERT J. STOWE

**Major Albert J. Stowe**

**Speaking as the personal representative of Major General George V. Strong, Assistant Chief of Staff, G-2, Military Intelligence Division, War Department, Washington, D. C.**

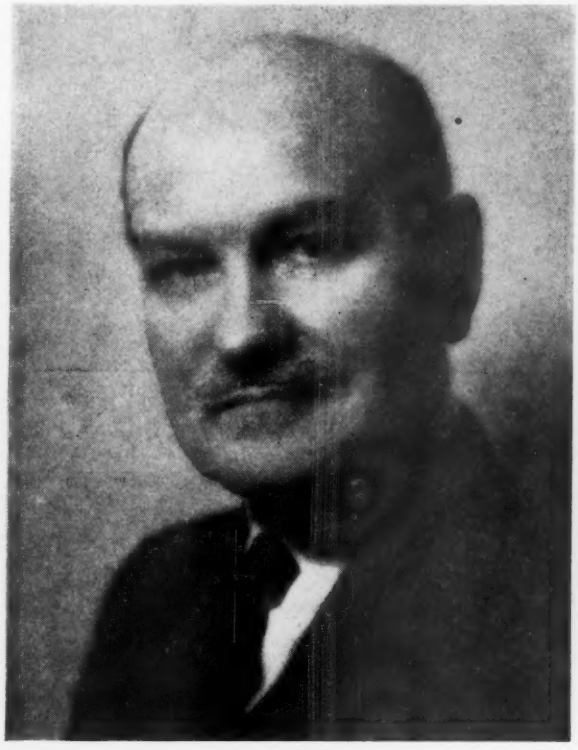
## LUNCHEON SPEAKER

## DOUGLAS CARSON

Mr. Carson will lecture at the Wednesday noon general luncheon on "English and Irish Eighteenth-Century Glass." His lecture will be illustrated by exhibits.

Douglas Carson has spent the better part of his career associated with English antiques. Shortly after he began his business career, World War One broke out and he joined the British Army. He was an officer in the Black Watch and served in the Machine Gun Corps in France and Belgium and later at the Northwest Frontier of India.

When the war was over, he relinquished his commission in the Army and returned to antiques where he soon developed a special interest in English and Irish glass. After several years in the markets of England, he came to the United States where he has remained ever since and where his knowledge and appreciation of antiques have served him well as Director of the Antique Department of Steuben Glass, Inc., New York, N. Y.



**Douglas Carson**

## EDWARD RAY WEIDLEIN

**Edward Ray Weidlein, Director, Mellon Institute, Pittsburgh, Pa. Subject: "Chemistry in Defense and Recovery."**

For biographical sketch, see *Bull. Amer. Ceram. Soc.*, **19** [9] 344–45 (1940).

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## MEMBERS IN SERVICE *

The following members of this Society are in fighting units of war service. There are several in service in Washington not included in this Service Roster. This list, which was begun September, 1942, and added to each succeeding month, is probably not complete, and we would appreciate information on other members.

(257) Joseph Albert, Metter, Ga.
(258) Elmer S. Fitzsimmons, Alfred University, Alfred, N. Y.
(259) Joseph Goldin, Standard Fuel Engineering Co., Detroit, Mich.
(260) W. Carey Hansard, Georgia School of Technology, Atlanta, Ga.
(261) George B. Hughes, 323 Washington St., Cedar Falls, Ia.
(262) Albert O. Knecht, Camden Pottery Div., Universal Sanitary Mfg. Co., Camden, N. J.
(263) William J. Koch, Rutgers University, New Brunswick, N. J.
(264) Lois Carolyn McKee, Universal Sanitary Mfg. Co., New Castle, Pa.
(265) William J. Whitener, North Carolina State College, Raleigh, N. C.

* These are in addition to the lists published monthly, beginning with the September, 1942, *Bulletin*, with the exception of the June, 1943, issue.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

## EDWARD ORTON, JR., FELLOW LECTURER

The 1944 Orton Fellow Lecture will be delivered by Hoyt C. Hottel, Professor of Fuel Engineering at the Massachusetts Institute of Technology, Cambridge, Mass., on the general subject of the transfer of heat by radiation.

**Hoyt C. Hottel**

For biographical sketch, see *Bull. Amer. Ceram. Soc.*, **23** [1] 13 (1944).

**Cecil Eugene Bales**

**President, The American Ceramic Society, and Presiding Chairman of War Conference.**

For biographical sketch, see *Bull. Amer. Ceram. Soc.*, **22** [4] 113–14 (1943).

**Walter Clarence Rueckel**

**Chairman, Pittsburgh Section, and Chairman, Local War Conference Committee.**

For biographical sketch, see *Bull. Amer. Ceram. Soc.*, **17** [12] 484 (1938).

**John William Jordan**

**Secretary, Pittsburgh Section, and Chairman, Equipment and Supplies Committee (also on this Committee in 1943).**

## JOHN WILLIAM JORDAN

John William Jordan was born in Pittsburgh, Pa., April 25, 1912, and received his elementary and high-school education in the Pittsburgh public schools. After a year at the University of Pittsburgh, he transferred to Marietta College, Marietta, Ohio, where he assisted in the Chemistry Department for two years. Obtaining the A.B. degree in 1934, he went to Columbia University, New York, N. Y., on a Residence Scholarship. At the end of the first year, he was granted an assistantship in the Department of Chemistry which he retained until receiving his Ph.D. degree in chemistry in 1938.

For a year he was Fellowship Assistant on the Technical Glassware Fellowship at Mellon Institute and was transferred in 1939 to the plant of the Pittsburgh Corning Corporation at Port Allegany, Pa., where he acted as plant, research, and development chemist in the field of structural glass products. In 1941, he returned to the Mellon Institute as Fellow on the Lead Fellowship, in which position he has been engaged in problems concerned with ceramic raw materials.

Dr. Jordan is a member of Phi Beta Kappa, Sigma Xi, Phi Lambda Upsilon, the American Association for the Advancement of Science, the American Chemical Society, and The American Ceramic Society.

**Publication**

"Effect of Anions on Rate of Dissolution of Ferric Oxide in Acid Solutions." Dissertation, Columbia University, 1938.

**Patent**

"Composite Building Unit," U. S. 2,333,7 3, Nov. 9, 1943.

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## HAROLD ELLIS SIMPSON

**Chairman, Entertainment Committee**
**Chairman, Papers and Program Committee, Design Division**
**Vice-Chairman, Pittsburgh Section**

Harold Ellis Simpson was born in Columbus, Ohio, June 16, 1903. He attended grade and high school in Columbus and was graduated from North High School in 1921. While attending the Ohio State University, his first industrial experience was obtained at the Brunt Porcelain Co., Chaseland, Ohio. Further practical experience was gained at the Peerless Brick Co., Columbus, Ohio, and at the Claycraft Mining and Brick Co., Taylor Station, Ohio.

In 1925, he was graduated from the Ohio State University, receiving the degree of B.Cer.E. The following year, he was appointed fellow in the U. S. Bureau of Mines at the Ohio State University Engineering Experiment Station, where he worked on problems in connection with the specific heats of clays. He received his M.S. degree in 1926. The next three years were devoted to postgraduate study of glasses and enamels with special reference to various eutectic formations. At that time, he was a fellow in the U. S. Bureau of Standards at the Engineering Experiment Station, Ohio State University. He received the Ph.D. degree in 1929, majoring in ceramics and minoring in physical chemistry, mineralogy, and geology.

A few months were spent as research engineer at the Ohio State University Engineering Experiment Station, Roseville, Ohio, on work involving the beneficiation of shales for brick and tile manufacture.

In 1929, he was appointed professor of ceramics and research associate in the Department of Ceramics at Rutgers University, New Brunswick, N. J. While at Rutgers, he taught the glass and enamel courses and conducted research on glasses, glazes, clays, and enamels.

In 1930, he joined the staff of the Battelle Memorial Institute, Columbus, Ohio, as research engineer, where he directed a study on the slagging of boiler refractories by various coal ashes, a study conducted in cooperation with the Boiler Furnace Refractories Committee of the A.S.M.E. Work was also carried out on the development of copper enamels for the Copper and Brass Research Association, New York, N. Y., to enhance and further the use of copper and copper alloys.

In 1936, he was appointed Industrial Fellow for the Pittsburgh Plate Glass Company at Mellon Institute, Pittsburgh, Pa. He worked on problems involving the solution of gases in glass and the durability of glass in storage. Since 1938, he has been Industrial Fellow for the United States Gypsum Company at Mellon Institute, where he has directed researches on the fundamental problems involved in the calcination of gypsum. This work has included the development of new products, improvement of the properties of various plasters, and has also involved a study of materials of construction, fillers, molds, and insulation.

**Harold Ellis Simpson**

He received the professional degree of Ceramic Engineer from Ohio State University in 1938. Dr. Simpson has been a member of The American Ceramic Society since 1924 and is also a charter member of the Institute of Ceramic Engineers. He is chairman of the Film Library Committee and a member of Committee C-11 (Gypsum) of A.S.T.M. He has served on the Publicity Committee for several Annual Meetings and as secretary of the Pittsburgh Local Section. At present, he is an abstracter for *Ceramic Abstracts*. His chief interests in The Society are glasses, enamels, refractories, and materials of construction.

**Publications**

(1) (With A. E. MacGee) "Diatomaceous Earth Casting, Slop Molding, and Casting Bodies," *Ceramist*, **8** [7] 445–50 (1926).

(2) "Heat Required to Fire Ceramic Bodies," *Jour. Amer. Ceram. Soc.*, **10** [11] 897–918 (1927).

(3) "Development of an Enamel on a Eutectic Basis," *ibid.*, **13** [1] 62–79 (1930).
(4) "Correcting Tenderness of Shale by Chemical Treatment," *ibid.*, [11] 817–22.
(5) "Classified Review of Refractory Slag Tests," *ibid.*, **15** [10] 536–44 (1932).
(6) "Investigation of Action of Coal-Ash Slags on Fire Brick by Microscopic Methods," *ibid.*, pp. 520–35.
(7) (With G. A. Bole and J. D. Sullivan) "Porcelain Enameling of Copper Presents Commercial Possibilities," *Ceram. Ind.*, **22** [6] 300–303 (1934).
(8) "Modern Trends in Buildings and Materials of Construction," *Proc. Building Officials Conf. America, 27th Annual Conf.*, 57–62 (1942).

## VICTOR HAWTHORNE REMINGTON

**Secretary-Treasurer, Ceramic Camera Club**

Victor Hawthorne Remington was born near Abilene, Kans., July 11, 1902. He attended grade school in Meriden, Kans., and was graduated from the Baldwin City (Kans.) high school in 1922. In 1926, he received his A.B. degree from Baker University, Baldwin City, Kans. Mr. Remington was the recipient of a graduate fellowship at Oklahoma A & M College, Stillwater, Okla., and in 1928 received his M.S. degree in chemistry.

Immediately upon graduation, Mr. Remington was employed by the B. F. Drakenfeld & Co., Inc., Washington, Pa. There he entered into research and development work on glass colors, products which previously had largely been imported. He is now manager of the Glass Colors Division of the Company.

Mr. Remington has been a member of The American Ceramic Society since 1937. He is also a member of the American Association for the Advancement of Science, the Washington Camera Club, and Phi Lambda Epsilon.

Victor Hawthorne Remington

**Publications**

(1) (With H. M. Trimble) "Oxidation Potentials of Some Hypochlorite Solutions," *Jour. Phys. Chem.*, **33** [3] 424–34 (1929).
(2) (With R. R. Shively) "Glass Calculations Simplified," *Glass Ind.*, **11** [10] 223–26 (1930).
(3) "Fundamentals in Application of Vitrifiable Colors," *Ceram. Ind.*, **23** [3] 144, 146 (1934).
(4) "Art of Decorating Glass: I, Spraying Process," *Glass Ind.*, **18** [5] 149–52 (1937); "II, Silk-Screen Process," *ibid.*, [6] 195–98; "III, Silk-Screen Process," *ibid.*, [7] 236–40; "IV, Miscellaneous Decorating Methods," *ibid.*, [8] 267–71.
(5) "Screen Color-Mixing Methods," *ibid.*, **22** [4] 154–56 (1941).
(6) "Silk-Screen Process in the Ceramic Industry," *Signs of the Times*, **105** [9] 32 (1943).

**Patents**

(1) (With Ray Andrews) "Ceramic Color and Process of Preparing Same," U. S. 2,225,659, Dec. 24, 1940.
(2) (With Ray Andrews) "Vitreous Enamel," U. S. 2,241,520, May 13, 1941.
(3) (With Ray Andrews) "Coloring Material," U. S. 2,267,255, Dec. 23, 1941.

## ARTHUR ATKINSON WELLS

Arthur Atkinson Wells

**Chairman, Committee on Research, since 1939 and member of Entertainment Committee in charge of Monday's informal dinner.**

For biographical sketch, see *Bull. Amer. Ceram. Soc.*, **21** [7] 124 (1942).

## OUR REGRETS

(1) A photograph and biographical sketch of I. W. Clark, Westinghouse Electric & Mfg. Co., Pittsburgh, Pa., who is to speak on the subject "Postwar Housing," were not available when this copy was made up.
(2) Also we do not have a photograph and personal history of A. Paul Thompson, Mellon Institute, Pittsburgh, Pa., who is General Chairman of the Committee on Arrangements.
(3) Nor do we have photographs of the ladies who are in charge of the ladies' entertainment.

# ACTIVITIES OF THE SOCIETY

## NEW MEMBERS IN FEBRUARY

### Corporation

ECLIPSE-PIONEER DIVISION, BENDIX AVIATION CORP., J. H. Hayner (voter), Building 1, Teterboro, N. J.

* HARBISON-WALKER REFRACTORIES CO., Kenneth Seaver (voter), 1800 Farmers Bank Bldg., Pittsburgh, Pa.

HULL, A. E., POTTERY CO., Gerald Watts (voter), Crooksville, Ohio.

MCLEOD & HENRY CO., INC., George A. Soper, Jr. (voter), 357 First St., Troy, N .Y.

MEXICANA DE TUBOS DE ALBANAL, S. A., J. O. Knizek (voter), Ferrocarriles Nacionales 200, Mexico, D. F., Mexico.

NORTH STATE PYROPHYLLITE CO., INC., E. M. Harvey (voter), Pomona, N. C.

### Personal

CALDWELL, SMILEY, JR., Adamston Flat Glass Co., Clarksburg, W. Va. (membership formerly in name of Donald Lantz).

* CROSKEY, CARL D., 5207 Garmouth Rd., Baltimore 29, Md.; ceramic engineer, Locke Insulator Corp.

DILLER, CHARLES C., Dresden St., Kensington, Md.; National Bureau of Standards.

ERWIN, HOWARD R., 8141 San Miguel, South Gate, Calif.; Pacific Tile & Porcelain Co.

* FALTER, ARTHUR H., 8635 Jacob Place, Niagara Falls, N. Y.; Carborundum Co.

GAINES, J. M., Linde Air Products Co., E. Park Dr. & Woodward Ave., Tonawanda, N. Y. (membership formerly in name of L. I. Dana).

GALLION, FREDERICK J., Research Dept., Haynes Stellite Co., Kokomo, Ind.; research chemist.

GREGORY, G. S., Phoenix Glass Co., Monaca, Pa. (membership formerly in name of C. L. Arnold).

HEILIGMAN, H. A., E. J. Lavino & Co., Box 29, Norristown, Pa.

LANDRON, RAFAEL, JR., Box 272, Corning, N. Y.; Corning Glass Works.

LYNCH, EUGENE D., 204 Ceramics Bldg., University of Illinois, Urbana, Ill.; research assistant.

* MARTIN, RICHARD H., 51 Nelson Place, Worcester, Mass.; Abrasive Products, Inc.

MCCLURE, HOWARD C., 1808 Hutchins St., Portsmouth, Ohio; sales engineer, Davis Fire Brick Co.

* MORGAN, WILLARD L., 1603 Guilford Rd., Columbus 8, Ohio; Libbey-Owens-Ford Glass Co.

NORDMEYER, RUDY L., Mission, Texas; general manager, Valley Brick & Tile Co.

* PATCH, JAMES B., 206 Howard St., Millville, N. J.; Whitall-Tatum Co.

RICE, GEORGE A., 8035 Cory Ave., Cleveland 3, Ohio; Ferro Enamel Corp.

ROSE, CHARLES R., 1875 10th St., Santa Monica, Calif.; aircraft industry.

RULON, RICHARD M., 336 New Holland Ave., Lancaster, Pa.; research engineer in glass technology, RCA Victor Div., Radio Corp. of America.

SHORT, A. C., 36 Hull Ave., St. Vital, Winnipeg, Manitoba, Canada; electrical engineer, Glass Containers, Ltd.

STEINER, HARRY C., 518 Sanders Ave., Scotia 2, N. Y.; General Electric Co.

SUTHERLAND, J. CLARK, Pacific Clay Products, 306 West Avenue 26, Los Angeles 31, Calif.

THURN, HALDON L., 709 E. Juneau Ave., Milwaukee 2, Wis.; teacher.

WHITE, EUGENE, 6328 Clara St., Bell, Calif.; teacher, Pepperdine College.

WURTSBAUGH, C. G., Pacific Clay Products, 306 West Avenue 26, Los Angeles 31, Calif.

ZAHN, WILLIAM A., 370 Central Ave., Orange, N. J.; assistant ceramist, Henry L. Crowley Co.

### Student

*New York State College of Ceramics:* ROBERT L. COLLIN, ERNEST FAUST, JR., AND ALFRED C. SAUNDERS.
*Rutgers University:* ALLAN S. HALPERN.
*University of Illinois:* LEWIS C. HOFFMAN.
*University of Toronto:* PETER W. GIBBS.

* Indicates former member of The Society rejoining.

## ROSTER CHANGES FOR FEBRUARY*

BERGIN, WILLIAM M., Owens-Corning Fiberglas Corp., Ashton, R. I. (Pawtucket, R. I.)

BOEKER, V. W., Owens-Corning Fiberglas Corp., Nicholas Bldg., Toledo, Ohio (Edwardsville, Ill.)

BOERNER, A. R., 1762 East 45th St., Cleveland 3, Ohio (Bridgeville, Pa.)

CHESNY, H. H., 130 East 75th St., New York, N. Y. (Cape May, N. J.)

CLAPHAM, CHARLES H., JR., North American Philips Co., Inc., Dobbs Ferry, N. Y. (Fairmont, W. Va.)

CRUCIANA, F. L., Box 748, R. D. 1, Freedom, Pa. (Monaca, Pa.)

DAY, RALPH K., Libbey-Owens-Ford Glass Co., Technical Dept., 1701 E. Broadway, Toledo, Ohio (Dayton, Ohio)

FRÉCHETTE, VAN DERCK, New York State College of Ceramics, Alfred, N. Y. (Corning, N. Y.)

GINGOLD, JACOB, 949 Park Ave., Plainfield, N. J. (Beverly Hills, Calif.)

GOTTLIEB, SIDNEY, United States Bureau of Mines, College Park, Md. (Tuscaloosa, Ala.)

HELLMERS, HENRY T., 141 Marks Ave., Lancaster, Ohio (Riverdale, Md.)

HENDREN, ROBERT R., McFeely Brick Co., First National Bank Bldg., Latrobe, Pa. (Cleveland, Ohio)

HUNT, JOHN F., Orefraction, Inc., 7505 Mead St., Pittsburgh, Pa. (Salem, Ohio)

KNAPP, WILLIAM J., 15 Blake St., Belmont, Mass. (New York, N. Y.)

LARKIN, PAUL G., General Delivery, Campbell, Calif. (San Jose, Calif.)

LAWRENCE, WILLIS G., American Brake Shoe Co., Metallurgical Dept., Mahwah, N. J. (Chicago Heights, Ill.)

MARTIN, FRANK B., R.F.D., Sunset Blvd., Cape May, N. J. (Pittsburgh, Pa.)

MCALPINE, KENNETH B., 1201 Union Ave., Brackenridge, Pa. (Tarentum, Pa.)

MCCANN, F. A., 4617 Seventh Ave., Los Angeles 43, Calif. (San Fernando, Calif.)

MELOY, CHARLES L., Apt. 1, 55 Elm St., Westfield, N. J. (Elizabeth, N. J.)

MOONEY, WILLIAM F., 1267 Glenneyre St., Laguna Beach, Calif. (Los Angeles, Calif.)

NICHOLSON, CLIFFORD M., Ancor Corp., Box 565, St. George, S. C. (Rochester, N. Y.)

RUSSELL, ROBERT G., 293 Buckingham St., Newark, Ohio (Chicago, Ill.)

SIMON, A. G., 1917 Wellesley Rd., San Marino 8, Calif. (Antioch, Ill.)

STANWORTH, JOHN E., 24, Ringinglow Rd., Ecclesall, Sheffield, England (Warwickshire, England)

WINBURN, SINCLAIR W., 1709 E. Ninth St., Little Rock, Ark. (Benton, Ark.)

* Address in parentheses is former address.

## *SYNERGISTIC WAR CONFERENCE*

April 2, 3, 4, and 5

A Programmed Exchange of Knowledge and Thought

---

For Forty-Six Years

By Meetings, Committees, and Publications

And by Promotion of Educational and Research Facilities

Members of The American Ceramic Society

Have Developed Ceramic Technology

By Which Ceramic Industries Have Kept Pace

With Constant Changing Economic Conditions

And Increasing Product Service Demands

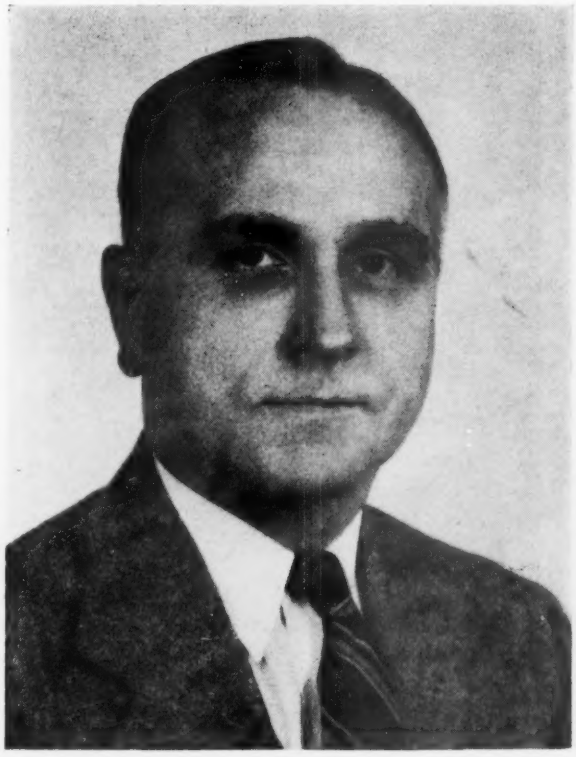
---

*It Has Paid To Be Synergistic*

PAID MEMBERSHIP AND SUBSCRIPTION RECORD

| Date of Record | Members Paid | | Deferred | Subscriptions | Monthly Sales | Total Circulation |
|---|---|---|---|---|---|---|
| | Personal | Corporation | | | | |
| December 21, 1942 | 2088 | 270 | 15 | 446 | 220 | 3039 |
| February 21, 1943 | 2095 | 267 | 10 | 451 | 220 | 3043 |
| September 21, 1943 | 2021 | 295 | 6 | 487 | 220 | 3029 |
| October 21, 1943 | 2043 | 302 | 6 | 501 | 220 | 3072 |
| November 21, 1943 | 2076 | 303 | 5 | 507 | 220 | 3111 |
| December 21, 1943 | 2096 | 309 | 4 | 501 | 220 | 3130 |
| January 21, 1944 | 2110 | 323 | 4 | 531 | 220 | 3188 |
| February 21, 1944 | 2147 | 330 | 4 | 540 | 220 | 3241 |

## PRESIDENT-ELECT, 1944–1945



**Edwin Henry Fritz**

## VICE-PRESIDENT-ELECT, 1944–1945

**C. Forrest Tefft**

Biographical sketches of Mr. Fritz and Mr. Tefft were published in *Bull. Amer. Ceram. Soc.*, **17** [3] 125–26 (1938) and **15** [1] 18 (1936), respectively.

## TREASURER-ELECT, 1944–1945

**John Daniel Sullivan**

For biographical sketch, see *Bull. Amer. Ceram. Soc.*, **19** [6] 234–35 (1940).

## JOSEPH SCOTT GREGORIUS

**Trustee-Elect from the Glass Division**

Joseph Scott Gregorius was born in Corning, N. Y., February 13, 1896. He was graduated from the Corning Free Academy in 1913 and for the following three years worked as laboratory assistant at the Corning Glass Works, Corning, N. Y. After graduating from the Ohio State University, Columbus, Ohio, in 1920, with the Bachelor of Engineering degree, he returned to the Corning Glass Works as research engineer.

In 1922, Mr. Gregorius became associated with the Calorizing Co., Pittsburgh, Pa., as production and service engineer. Two years later, he joined the staff of the Pittsburgh Plate Glass Co., Creighton, Pa., as research engineer and held this position until 1938, when he became assistant director of research of the Glass Division. Since 1942, he has been technical adviser for the Manufacturing Department of the same Company.

Mr. Gregorius has been a member of The American Ceramic Society since 1920 and a Fellow of The Society since 1938. He served as vice-chairman of the Glass Division and as a member of the Glass Division Papers and Program Committee in 1935–1936 and was chairman of the Division in 1936–1937.

He is also a member of the Founder's Group of the Institute of Ceramic Engineers and is a District Committee member of the American Society for Testing Materials

and member of the Advisory Committee of A.S.T.M. Committee C–14. He was elected to Sigma Xi in 1920.

**Publications**

(1) (With W. A. Mahaffey) "Condensable Vapors in a Tank Furnace Melting a Saltcake Batch," *Jour. Amer. Ceram. Soc.*, **17** [10] 307–309 (1934).

(2) "Mechanical Strength of Glass and Its Resistance to Thermal Shock," *Bull. Amer. Ceram. Soc.*, **14** [8] 272–73 (1935).

(3) "Modulus of Rupture and Thermal-Shock Resistance at Elevated Temperatures," *ibid.*, **15** [8] 271–73 (1936).

Joseph Scott Gregorius

**Patents**

(1) "Apparatus for Maintaining Level in Glass Tanks," U. S. 1,580,135, April 13, 1926.

(2) "Apparatus for Making Sheet Glass," U. S. 1,596,654, Aug. 17, 1926.

(3) (With W. G. Koupal) "Apparatus for Making Sheet Glass," U. S. 1,598,729, Sept. 7, 1926.

(4) "Apparatus for Making Sheet Glass," U. S. 1,610,443, Dec. 14, 1926.

(5) (With W. G. Koupal) "Glass-Drawing Apparatus," U. S. 1,631,138, June 1, 1927.

(6) "Apparatus for Drawing Sheet Glass," U. S. 1,631,319, June 7, 1927.

(7) (With W. G. Koupal) "Regulating Glass Temperatures in Drawing Tanks," U. S. 1,698,369, Jan. 8, 1929.

(8) "Apparatus for Drawing Sheets of Glass," Brit. 403,033, Dec. 14, 1933.

(9) "Glassmelting Tank and Apparatus for Drawing Sheet Glass," U. S. 1,956,170, April 24, 1934.

(10) "Glassmelting Tank and Apparatus for Manufacture of Window Glass by Upward Drawing," U. S. 2,006,352, July 2, 1935.

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For biographical sketch of Professor Campbell, see *Bull. Amer. Ceram. Soc.*, **22** [7] 257 (1943).

## TRUSTEE-ELECT FROM INSTITUTE OF CERAMIC ENGINEERS

Hobart McKinley Kraner

## TRUSTEE-ELECT FROM CERAMIC EDUCATIONAL COUNCIL

Robert Morrell Campbell

## JAMES WILSON HEPPLEWHITE, JR.

**Trustee-Elect from the White Wares Division**

James Wilson Hepplewhite, Jr., was born July 27, 1893, in Audenried, Pa., attended grade and high schools in Cleveland, Ohio, and was graduated in 1910 from South High School, Cleveland, Ohio.

He was associated with the Cleveland Electric Illuminating Co., Cleveland, Ohio, for five years prior to entering the Ohio State University, Columbus, Ohio, in 1915, from which university he was graduated in 1920 with a B.S. degree in ceramic engineering. His collegiate training was interrupted during 1918 by a directive to pursue problems related to the effort of World War I at the Ceramic Experiment Station of the Bureau of Mines, Columbus, Ohio, under the supervision of the late R. T. Stull. He also received the degree of professional ceramic engineer from the Ohio State University in 1936 and is a member of Tau Beta Pi.

**James Wilson Hepplewhite, Jr.**

Following graduation, he was employed by the Koppers Company fellowship at Mellon Institute, Pittsburgh, Pa., to engage in research and development of silica refractories for coke ovens and later was associated with the Johns-Manville Corp., Manville, N. J., on research and development of refractory cements and insulating brick. Since 1923, he has been ceramic engineer in charge of research and control with The Edwin M. Knowles China Co., Newell, W. Va., manufacturers of semivitreous dinnerware.

During 1919, Mr. Hepplewhite joined The American Ceramic Society as an associate member and was elevated to regular membership in 1920. He was elected to the Fellowship of The Society in 1939 and is a charter member of the Institute of Ceramic Engineers.

He is chairman of the Research Committee of the United States Potters Association, is affiliated with the Pittsburgh Section of The American Ceramic Society (secretary in 1921 and treasurer from 1936 to 1940), the East Liverpool Ceramic Engineers Club (charter member), and the East Liverpool Rotary Club.

His Division activities with the parent Society have been as follows: Chairman, Committee on Membership, Refractories Division (1923–1924), and, for the White Wares Division, member, Committee on Statistics (1933–1934); Chairman, Membership Committee (1935–1936); member, Papers and Program Committee (1936–1937); Secretary of the Division (1937–1938); and Chairman, Nominating Committee (1938–1939, 1942–1943).

**Publications**

(1) "An Attempted Measurement of the Thermal Conductivity of Refractories," *Bull. Amer. Ceram. Soc.*, **1** [1] 5–7 (Feb., 1922).

(2) "Weathered Clay Imparts Quality to Semivitreous Bodies," *Ceram. Ind.*, **13** [3] 262 (1929).

(3) "Notes on a Continuous Electric Decorating Kiln," *Bull. Amer. Ceram. Soc.*, **13** [2] 44–45 (1934).

(4) "Effect of $ZrO_2$ and $TiO_2$ upon Resistance to Crazing of a Typical Glaze for Semivitreous Dinnerware," *Jour. Amer. Ceram. Soc.*, **20** [2] 60–61 (1937).

(5) "Symposium on Organic Electrolytes: I, Use of an Ammoniacal Electrolyte for a Plastic Body," *Bull. Amer. Ceram. Soc.*, **18** [6] 191–92 (1939).

## FREDRICK ADOLPH PETERSEN

**Member, Enamel Division Standards Committee**

Fredrick Adolph Petersen was born August 19, 1913, in Chicago, Ill. He attended public school in Chicago and was graduated from Lane Technical High School in 1931.

**Fredrick Adolph Petersen**

He matriculated at the University of Illinois, Urbana, Ill., in 1933 and received the B.S. degree in ceramics from this University in 1937. In 1938, he went to the Ohio State University, Columbus, Ohio, on a cooperative fellowship sponsored by the Texas Mining & Smelting Co., Laredo, Tex. The work of the fellowship dealt with the use of antimony oxide in vitreous enamels. In June,

1939, he received the M.S. degree from the Ohio State University.

His industrial experience has dealt with the vitreous enameling industry. Industrial connections have been with the Frigidaire Corp., Dayton, Ohio; the Rundle Manufacturing Co., Milwaukee, Wis.; the Ingram-Richardson Manufacturing Co. of Indiana, Inc., Frankfort, Ind.; and the Florence Stove Co., Gardner, Mass.

During the past two years, Mr. Petersen has been located at the University of Illinois in the Department of Ceramic Engineering, working on a cooperative research project sponsored by the Enameled Utensil Manufacturers' Council. During this time, work has been carried on in setting up standard tests for the enameled utensil industry and in studying various properties of this type of utensil.

He is a member of Sigma Xi and Keramos and has been a member of The American Ceramic Society since 1939.

**Publications**

(1) "Nepheline Syenite as Mill Addition in Ground-Coat Enamels," *Proc. Porcelain Enamel Inst. Forum, Fifth Forum, Oct., 1940*, pp. 109–10.

(2) (With C. Hutchison) "Electrolytes in Acid-Resisting Enamels," *Jour. Amer. Ceram. Soc.*, **24** [2] 51–57 (1941).

(3) (With A. I. Andrews) "Enameled Utensil Manufacturers' Council Tentative Standard Solubility Test for Porcelain Enameled Cooking Utensils." To be published in the April, 1944, issue of the *Journal of The American Ceramic Society*.

## MONROE JOHN BAHNSEN

### Member, Enamel Division Nominating Committee

Monroe John Bahnsen was born in Port Clinton, Ohio, March 5, 1906. He was graduated from Port Clinton High School in June, 1924, and received the degree of Bachelor of Science in Chemical Engineering from the Case School of Applied Science at Cleveland, Ohio, in June, 1929.

Monroe John Bahnsen

He was employed at the Cleveland plant of the Grasselli Chemical Company from July, 1929, to September, 1930.

He then entered the Graduate School of Western Reserve University, Cleveland, Ohio, and in July, 1931, was awarded the Cushman Fellowship for fundamental research in porcelain enamels. This research extended from July, 1931, to June, 1934, on the subject "The Thermal Analysis of the System $Na_2O$–$SiO_2$–NaF."

He received the degree of Doctor of Philosophy in Chemistry from Western Reserve University in June, 1934, and was immediately employed as research chemist by the Ferro Enamel Corp., Cleveland, Ohio. In 1941, he was appointed assistant director of the Ferro Laboratories. In December, 1943, he was appointed director of chemical research of the Ferro Enamel Corporation.

Dr. Bahnsen is a member of The American Ceramic Society, the American Chemical Society, the American Institute of Chemists, Sigma Xi, Alpha Chi Sigma, Phi Kappa Tau, and is a registered chemical engineer in the State of Ohio. He is currently a councillor of the Cleveland Section of the American Chemical Society.

**Publications**

Dr. Bahnsen has presented several papers before The American Ceramic Society and has contributed the following to the published literature:

(1) (With H. S. Booth and B. A. Starrs) "System Sodium Disilicate–Sodium Fluoride," *Jour. Phys. Chem.*, **37** [9] 1103–1107 (1933).

(2) "System Sodium Oxide–Sodium Fluoride–Silicon Dioxide." Doctorate Thesis, Western Reserve University Graduate School, 1934.

(3) "Review of Theories on Adherence of Sheet-Steel Enamels," *Enamelist*, **12** [12] 16–17, 64 (1935).

(4) "Mill Additions," Chapter VI, pp. 116–43, in Manual of Porcelain Enameling (J. E. Hansen, editor), 1937; reprinted in *Emaillerie*, **6** [2] 13–15, 18–22; [5] 13–19; [6] 13–21; [7] 6–9 (1938).

(5) (With B. J. Sweo) "Stabilized Recoat Enamel," *Enamelist*, **16** [1] 5–12 (1938).

(6) (With B. J. Sweo) "Stabilization of the Reflectance and Color of Recoat Enamels," *Ferro Enamel Corp. Tech. Bull.*, No. 2, 19 pp. (July 5, 1938).

(7) (With L. S. O'Bannon) "Errors in Reflectance Measurements of Porcelain Enamel Surfaces," *ibid.*, No. 3, 30 pp. (Oct. 1, 1939).

**Patents**

(1) (With G. H. McIntyre and B. J. Sweo) "Opacifier," U. S. 2,189,148, Feb. 6, 1940.

(2) (With E. E. Bryant) "Porcelain Enamel," U. S. 2,250,456, July 29, 1941.

(3) (With E. E. Bryant) "Porcelain Enamel," U. S. 2,250,457, July 29, 1941.

(4) (With G. H. McIntyre) "Opacifier and Porcelain Enamel Containing Same," U. S. 2,319,247, May 18, 1943.

(5) (With E. E. Bryant) "Porcelain Enamel," U. S. 2,324,812, July 20, 1943.

## A PITTSBURGH PERSONALITY

## PHILIP d'HUC DRESSLER

### Vice-President of the Swindell-Dressler Corporation

Philip d'Huc Dressler was born in Chelsea, London, October 14, 1893, in the living quarters attached to the studio of his father, Conrad Dressler, a sculptor interested in ceramics. As a child, Mr. Dressler lived in the Heights above the little town of Marlow in Buckinghamshire in the beautiful stretch of the Thames Valley below Henley.

At the time, his father was carrying on his work at the Medmenham Pottery, which he established in that locality, as he has described in one of his last papers published by The American Ceramic Society.* As a child, Philip Dressler played with clay, making tile, and spent much time around the muffle kilns. He also sat for some of his father's enameled terra-cotta panels.

He had the usual schooling of an English boy, leaving home to enter a preparatory boarding school at the age of eight, then later, at the age of twelve, entering Felsted, the well-known public school in Essex founded in 1564 by Richard Lord Rich, who had been chancellor in the time of Henry VIII. Perhaps the best-known alumni of Felsted were the members of the Cromwell family. From Felsted, he went on to Cambridge, spending three years at Clare College. When he was graduated from Cambridge in 1914 with the B.A. degree, he took the natural sciences Tripos and was awarded first-class honors in both the first and second parts, specializing in chemistry. He received the M.A. degree from Cambridge in 1920.

**Philip d'Huc Dressler**

In his undergraduate days, his professor was William Pope, famous for his work on optically active compounds of a number of elements besides carbon and later knighted in recognition of his success in developing during the last war a much simpler method of making mustard gas than that used by the Germans, which put the Allies into a position of great advantage in the final battles.

After leaving Cambridge, Mr. Dressler spent a year working for his father in the Dressler Tunnel Oven Company, Ltd., which Conrad Dressler had formed to develop his invention in England. In 1915, he sold the first kiln in the United States to the Universal Sanitary Manufacturing Company at New Castle Junction, Pa., and Philip Dressler was sent here to help work out the problems of the first application to the sanitary-ware industry.

When the American Dressler Tunnel Kilns, Inc., was formed by Walter S. Kupfer, C. J. Kirk, and Conrad Dressler in Cleveland, Ohio, in 1917, Philip Dressler joined the staff as thermal engineer. His job was to work out the problems of making kilns perform, which in those days was no sinecure. He later became chief thermal engineer when the staff was expanded, then vice-president, which position he held at the time of Mr. Kupfer's death in 1926.

At that time, William Swindell & Brothers of Pittsburgh bought an interest in the American Dressler Tunnel Kilns and E. H. Swindell became president. At his death in 1928, Mr. Dressler succeeded to this title. In 1930, American Dressler Tunnel Kilns and William Swindell & Brothers combined to form the present Swindell-Dressler Corporation. At this time, he became vice-president in charge of the Tunnel Kiln Department, which position he has held until the present.

Thus Philip Dressler's whole active life has been spent in working out problems and in developing different types of tunnel kilns for different purposes and he has had the satisfaction that comes from being able to follow through with an interest developed in his boyhood days.

He has been a member of The American Ceramic Society since 1917 and was elected to the Fellowship in 1931. He is affiliated with the Materials and Equipment Division.

He is also a member of the Ohio State Clayworkers Association and the Institute of Ceramic Engineers.

**Publications**

(1) "Progress in Economy and Efficiency in Firing," *Trans. Amer. Ceram. Soc.*, **17**, 527–48 (1915).

(2) (With C. A. Stone) "Working Points of a Dressler Kiln," *Brick*, **53**, 33 (1918).

(3) "Automatic Control of a Tunnel Kiln, I–III," *Fuels & Furnaces*, **2** [1] 33; [2] 125; [3] 249 (1924).

(4) "Tunnel Kilns in the Refractories Industry," *ibid.*, **3**, 127–32 (1925).

(5) "Tunnel Kilns for Burning Silica Brick," *ibid.*, pp. 243–47.

(6) "Adaptation of Tunnel and Car Kilns to Firing Refractories," *Jour. Amer. Ceram. Soc.*, **8** [1] 43–54 (1925).

(7) (With L. T. Strommer) "Use of Muffle Tunnel Kilns for 'Arching' of Plate Glass Pots," *ibid.*, [4] 216–26.

(8) "Tunnel-Kiln Development in the Ceramic Industries, I," *Ceram. Age*, **10** [3] 81–91 (1927); "II, Direct-Fire Kilns," *ibid.*, [4] 122–30.

(9) "Progress in Elimination of Saggers in Firing of Glost and Bisque General Ware and Glost Wall Tile," *Jour. Amer. Ceram. Soc.*, **13** [2] 143–49 (1930).

(10) "Advantages of Tunnel Kiln," *Blast Furnace & Steel Plant*, **19** [5] 724 (1931).

(11) "Fuel-Fired and Electric Tunnel Kilns in the Ceramic Industry," *Jour. Can. Ceram. Soc.*, **4**, 20–21 (1935).

(12) "Application of Recirculating Gas-Tube Firing System to Continuous Decorating Kilns," *Jour. Amer. Ceram. Soc.*, **20** [12] 383–88 (1937).

(13) "Symposium on Importance of Thermal History: I, Problems of Firing Ceramic Ware in Tunnel Kilns," *Bull. Amer. Ceram. Soc.*, **18** [11] 411–16 (1939).

(14) "Gas-Fired Decorating Kiln," *Ind. Heating*, **6** [3] 220–26 (1939).

(15) "Top-Fired Tunnel Kiln Uses Coal to Fire Clayware Economically," *Brick & Clay Record*, **96** [4] 22–23 (1940).

**U. S. Patents**

(1) "Tunnel-Kiln Combustion Chambers," U. S. 1,330,432, Feb. 10, 1920.

(2) "Tunnel Kiln," U. S. 1,330,433, Feb. 10, 1920.

(3) "Combustion Chambers," U. S. 1,348,486, 1920.

(4) "Tunnel Kiln," U. S. 1,354,541, Oct. 5, 1920.

(5) "Gas-Producer Conduits," U. S. 1,354,542. 1920.

* See *Bull. Amer. Ceram. Soc.*, **19** [12] 484–86 (1940).

(6) "Combined Muffle and Open-Tunnel Kilns," U. S. 1,360,625, 1920.
(7) "Combined Muffle and Open-Tunnel Kilns," U. S. 1,360,626, 1920.
(8) "Tunnel Kiln," U. S. 1,366,369, Jan. 25, 1921.
(9) "Method and Means for Supporting Tile, Especially While Subject to Heat-Treatment," U. S. 1,368,219, Feb. 8, 1921.
(10) "Tunnel Kiln and Method of Operating Same," U. S. 1,369,330, Feb. 22, 1921.
(11) "Tunnel Kilns," U. S. 1,384,434, 1921.
(12) "Tunnel Kiln with Sectional Combustion Chambers," U. S. 1,384,435, July 12, 1921.
(13) "Burners for Tunnel Kilns," U. S. 1,385,986, Aug. 2, 1921.
(14) (With L. T. Strommer) "Burner for Furnaces," U. S. 1,491,587, April 22, 1924.
(15) "Tunnel Kiln and Method of Operating Same," U. S. 1,505,767, Aug. 19, 1924.
(16) "Tunnel Kiln and Method of Operating Same," U. S. 1,505,768, Aug. 19, 1924.
(17) "Tunnel Kiln," U. S. 1,506,573, Aug. 26, 1924.
(18) "Kiln Car," U. S. 1,521,216, Dec. 30, 1924.
(19) "Recuperators," U. S. 1,522,000.
(20) "Open-Fire Tunnel Kiln," U. S. 1,525,232, Feb. 3, 1925.
(21) "Furnace Construction and Operation," U. S. 1,525,725, 1925.
(22) "Methods and Means for Handling Material in Annealing," U. S. 1,556,209.
(23) "Tunnel-Kiln Heating Means," U. S. 1,615,217, Jan. 25, 1927.
(24) "Reciprocating Car Kiln," U. S. 1,638,988, Aug. 16, 1927.
(25) "Open-Fire Kiln," U. S. 1,651,380, Dec. 6, 1927.
(26) "Method and Apparatus for Gasification," U. S. 1,698,493, Jan. 8, 1929.
(27) "Kiln-Heating Means," U. S. 1,744,453, Jan. 21, 1930.
(28) "Methods of Preparing Fuel," U. S. 1,812,432, June 30, 1931.
(29) "Kiln Heating," U. S. 1,828,492, Oct. 20, 1931.
(30) "Ware Support," U. S. 1,885,691, Nov. 1, 1932.
(31) "Tunnel Kiln," U. S. 1,916,363, July 4, 1933.
(32) "Fuel-Treating Apparatus," U. S. 1,928,415.
(33) "Continuous Tunnel Kiln and Method of Operating Same," U. S. 1,988,837, Jan. 22, 1935.
(34) (With E. A. Hanff) "Circular-Type Tunnel Kiln and Method of Operating Same," U. S. 1,999,356, April 30, 1935.
(35) "Continuous Tunnel Kiln," U. S. 2,020,140, Nov. 5, 1935.
(36) "Tunnel-Kiln Construction and Method of Operation," U. S. 2,159,965, May 30, 1939.
(37) (With F. W. Brooke) "Tunnel Kiln," U. S. 2,320,-172, May 25, 1943.

**British Patents**

(1) "Firing Tile," Brit. 12,581, Sept. 1, 1915.
(2) "Supports for Ceramic Ware during Firing," Brit. 333,402, Aug. 20, 1929.
(3) "Muffle Furnaces," Brit. 422,985, Jan. 23, 1935.

## PORTRAIT OF GEORGE HERBERT BROWN

A life-sized oil painting of the late George Herbert Brown was presented to Rutgers University, New Brunswick, N. J., by the Ceramic Association of New Jersey during the annual meeting of the Association held December 10, 1943.

The presentation address was made by Henry F. Kleinfeldt, chairman of the Executive Committee during the past year.

"In the passing of Professor Brown," he said, "we have lost a real friend. He was a man who possessed many fine traits. Among them was his ability to accomplish whatever he set out to do and this was exemplified in his early life. He received his education the hard way and found it necessary to work during his college years, having had to interrupt his course for a year to earn enough to carry him through. The spirit of doing the difficult things was typical of him throughout his entire career."

Mr. Kleinfeldt then outlined the life of Professor Brown* and discussed his activities in the interest of the Ceramic Department at Rutgers, of which he was director for twenty-seven years, and his various accomplishments.

August Staudt, councillor of the Association, unveiled the draped portrait supported on an easel and Robert C. Clothier, president of Rutgers University, made an appropriate address accepting the gift on behalf of the Board of Trustees of the institution.

The portrait is the work of Frederic C. McDan, a well-known artist personally acquainted with Professor Brown for many years. It will hang in the assembly room of the Ceramics Building, taking its place with those of Edward Orton, Jr., and Charles A. Bloomfield located in the building for a number of years.

* Biographical sketches of Professor Brown have appeared in *Ceram. Age*, **41** [2] 52 (1943) and *Bull. Amer. Ceram. Soc.*, **22** [7] 211–14 (1943).

Be Ye a Rugged Individual
Enjoy Free Enterprise

Life-sized painting of George Herbert Brown

# PROPOSED AMENDMENTS TO RULES OF THE STRUCTURAL CLAY PRODUCTS DIVISION TO BE PRESENTED APRIL, 1944*

### Article SR VII. Nominations and Elections

Section (1) (*a*) To read: The Division Nominating Committee shall consist of three members to be nominated, and elected by secret ballot, at the business meeting of the Division at the time of the Annual Meeting of THE SOCIETY. They shall choose their own Chairman. They shall serve one year and are not eligible for re-election prior to the third succeeding year. Their duties are to present nominees for the offices of the Division.

Section (3) (*a*) The Division Chairman shall promptly transmit the nominations to the General Secretary of THE SOCIETY for publication 70 days before the opening date of the Annual Meeting of THE SOCIETY.

Section (3) (*b*) Substitute: The ballots shall be prepared in combination with the ballots of THE SOCIETY by the General Secretary as provided in the Revised Rules of THE SOCIETY, Article R VII, Section (3) (*a*).†

Section (3) (*c*) Substitute: The ballots shall be issued from the office of THE SOCIETY at least 60 days before the opening date of the Annual Meeting; returned to the office of THE SOCIETY 30 days before the opening date of the Annual Meeting; and counted by authorized representatives of THE SOCIETY not later than 15 days before the opening date of the Annual Meeting of THE SOCIETY. A plurality of the votes cast shall constitute election.

Section (3) (*d*) Substitute: The names of the elected Divisional officers shall be reported promptly to the retiring Chairman of the Division.

Section (5) To read: In the event of refusal to act or incapacity to act of the Division Trustee representative, a successor to fill the vacancy shall be selected promptly by agreement of the majority of the other members of the Division Executive Committee. The appointee's name and acceptance in writing shall be promptly transmitted to the General Secretary of THE SOCIETY by the Division Chairman, and he shall serve until the next annual meeting. The unexpired term, if any, shall be filled by election of a Trustee representative prior to the next annual meeting as provided in Article SR VII, Section (4).

### Article SR XI. Committees

Section (1) Delete "(*g*) Data" and alter "(*h*)" to "(*g*)," "(*i*)" to "(*h*)," and "(*j*)" to "(*i*)."

Sections (2) to (7) As is.

Section (8) Delete.

Section (9) Alter to (8) as is.

Section (10) Alter to (9) as is.

Section (11) Alter to (10) as is.

Section (12) Alter to (11) as is.

Section (13) Alter to (12) and place "and" before "Classification" and delete "and Data."

—HOWELLS FRÉCHETTE, *Chairman*,
*Committee on Rules*

Ottawa, Ontario, February 8, 1944

* References are in regard to the Revised Rules of the Division as adopted April, 1943.

† See *Bull. Amer. Ceram. Soc.*, **23** [1] 7 (1944).

# NECROLOGY

## MRS. ARTHUR F. WEAVER

Word has been received of the death on January 18, 1944, of Mrs. Arthur F. Weaver of Cleveland, Ohio.

Mrs. Weaver had been a member of The American Ceramic Society for twenty-one years and was affiliated with the Design Division.

## FRANK H. WHELDEN

Frank H. Whelden, secretary of the Detroit-Star Grinding Wheel Co., Detroit, Mich., died January 15, 1944, following a long illness.

Mr. Whelden, a nephew of Gilbert Hart, founder of the Detroit Emery Wheel Company, was born November 29, 1868, in Proctorsville, Vt., moved with his family to Detroit in 1874, and attended the Detroit public schools.

During the early part of his business career, Mr. Whelden was associated with his uncle's Company, the Detroit Emery Wheel Company (later known as the Detroit Grinding Wheel Company), as secretary and treasurer. He remained with this Company when, in 1919, it joined with the Star Corundum Wheel Company to form the Detroit-Star Grinding Wheel Company.

Mr. Whelden was director of the General Abrasive Company for many years and at the time of his death was director of the Federal Motor Truck Company, a post he had held for several decades.

A thirty-second degree Mason, Mr. Whelden was one of the first presidents of the Detroit Auto Club and was a life member of the Detroit Boat Club.

He is survived by his widow, Lillian H.; two sons, Gilbert H. (also associated with the Detroit-Star Grinding Wheel Company) and Lt. Ford H.; and six grandchildren.

Frank H. Whelden

# LOCAL SECTIONS

## MICHIGAN-NORTHWESTERN OHIO SECTION

The Michigan-Northwestern Ohio Section met January 22 in Detroit, Mich. We had an enjoyable evening with twenty members in attendance. Dinner was followed by a talk by C. E. Bales, president of The American Ceramic Society, who outlined the aims and activities of other groups in The Society. His talk was followed by a general discussion of Society plans and problems.

The next meeting will be held in May.

—J. F. QUIRK, *Chairman*

## PITTSBURGH SECTION

The second meeting of 1944 for the Pittsburgh Section was held February 8, 1944, in the Mellon Institute auditorium.

Harold Simpson, Vice-Chairman, opened the meeting by introducing the guests of honor, Cecil E. Bales and Ross C. Purdy. Mr. Bales complimented the Local Section on its activities and stressed the importance of the sectional groups as backbones of the National Society. A. P. Thompson was introduced as local chairman in charge of the Annual Meeting to be held in Pittsburgh April 2–5.

Robert F. Ferguson, of Battelle Memorial Institute, Columbus, Ohio, delivered the talk of the evening on "The Postwar Future of the Glass Bottle." Delving into antiquity, Mr. Ferguson traced the development of the liquid container. Remarkable for an old established industry was the jump in production of glass containers in this country from 2 billion in 1909 to 13 billion in 1943. This new lease on life was given by the invention of the automatic bottle machine, by the opening of new fuel reserves, and by the rapid growth of the packaging industry as a whole.

In the postwar period, glass will face competition chiefly from the "tin" can, as recent advances in tin technology are indeed formidable; aluminum, plastics, and resin-bonded paper will contribute to the competition.

Competition can best be met by (1) neglecting the ferrous iron color and thereby reducing batch costs; (2) adhering to simplicity of standard bottle design, adopting the "utility" bottle of the Glass Container Association; (3) eliminating breakage in the filling line through 100% automatic proof testing; and (4) bringing the price down to the "tin"-can level by using more cullet and by stressing the "ace in the hole," viz., re-use.

The speaker's talk was humorously informative and interesting, and a lively discussion with glassmen of the district followed.

—J. W. JORDAN, *Secretary*

## UPSTATE NEW YORK LOCAL SECTION FORMED

A meeting of members of The American Ceramic Society residing in New York State, exclusive of the metropolitan area, was called by M. E. Holmes at the Statler Hotel, Buffalo, N. Y., January 29, 1944, at 1:00 P.M.

The following were present: M. E. Holmes, C. R. Amberg, C. M. Harder, R. M. Campbell, S. R. Scholes, and J. F. McMahon, New York State College of Ceramics, Alfred, N. Y.; S. F. Walton, Exolon Co., Tonawanda, N. Y.; James P. Mulroy, Department of Education, Buffalo, N. Y.; Charles Jacobs, Art School, Univ. of Buffalo, Buffalo, N. Y.; Alice Flannigan, Buffalo Pottery, Inc., Buffalo, N. Y.; Lulu Scott Backus, Rochester Athenaeum and Mechanics Institute, Rochester, N. Y.; J. L. Austin, Arthur Falter, Peter de Leeuw, and Joseph A. Proe, Jr., Carborundum Co., Niagara Falls, N. Y.; G. D. Phillips, Olean Tile Co., Olean, N. Y.; J. T. Littleton and W. W. Oakley, Corning Glass Works, Corning, N. Y.; H. D. Prior, E. E. Kunzman, and Everett Thomas, Titanium Alloy Mfg. Co., Niagara Falls, N. Y.; Paul Whelan, Earl Solomon, Grant S. Diamond, and Milton H. Berns, Electro Refractories & Alloys Corp., Buffalo, N. Y.; and R. C. Purdy, General Secretary, The American Ceramic Society, Inc., Columbus, Ohio.

The meeting was called to order by M. E. Holmes, who conducted an election for a Chairman. Milton H. Berns was elected and appointed E. E. Kunzman as temporary secretary.

The Chairman called upon M. E. Holmes to explain the purposes of the meeting. He stated that in a recent conversation with President Bales it was suggested that a Local Section of The American Ceramic Society be formed comprising New York State exclusive of the metropolitan area. He told of the questionnaire which he submitted to 157 members in this area. Although only 20% of these questionnaires were returned, nearly all of the 20% were in favor of such an organization.

The Chairman threw open the meeting for discussion and called upon each person present to express himself on the question. The remarks are summarized as follows:

R. C. PURDY: Discussed other Local Sections. Such Sections have been helpful in building up the spirit and activities of The Society. They help local industries; they often tie in with industries peculiar to a certain section. There is usually quite a social feature connected with most Sections. They build up acquaintances and solidarity to promote programs of The American Ceramic Society.

M. E. HOLMES: Such an organization should not have as a primary objective the promoting of the interests of the Ceramic Association of New York or of the New York State College of Ceramics.

S. F. WALTON: There was a Western New York Section of The American Ceramic Society during World War I which died out because of postwar problems. He would like to see something on this order renewed or continued. Should try to bring in plant executives and superintendents and interest them in The Society.

R. C. PURDY: Local Sections have many members who are not members of The American Ceramic Society.

C. R. AMBERG: Local Sections can be stimulating and offer opportunity for students to contact ceramists.

J. P. MULROY: Discussed a local body of engineers which had been successful only because the social activities were stressed. Might be difficult to get together a program for ceramists as Buffalo has few ceramic plants.

GRANT S. DIAMOND: Such an organization would form a nucleus for Alfred graduates. He noted that there is quite a Society membership in this section. Highly endorsed such a Section to be built around younger and less well-known men rather than top men in management.

R. C. PURDY: Mentioned that Local Sections often arranged meetings with other local organizations.

EARL SOLOMON: Favored such a move. Felt that after formal organization many more men would attend.

CHARLES JACOBS: Stressed the need of getting the "little" people interested. Should get Buffalo and the general public educated to U. S. ceramics.

ALICE FLANNIGAN: Felt that such an organization would offer an excellent opportunity to contact ceramists who are unable to attend The American Ceramic Society Meeting.

C. M. HARDER: Believed ceramic artists would be definitely interested.

LULU S. BACKUS: Should have round-table talks and get acquainted but not concentrate on social functions. Could work toward rehabilitation of servicemen.

R. M. CAMPBELL: Declared it was an excellent op-

portunity for social and educational contacts. Against setting up an organization as a direct booster of the New York State College of Ceramics. Should advertise in papers and invite the public to hear speakers and educate them on ceramics. Stated that the amount of territory involved might be a drawback.

J. L. AUSTIN: Believed we should affiliate with The American Ceramic Society and put the younger men to the fore.

G. D. PHILLIPS: Commented on the healthy atmosphere prevailing at the present meeting inasmuch as all present seemed very open minded on the subject. Should try to definitely foresee the outcome of such a society and to decide just what relations with the New York State College of Ceramics would be.

(There then ensued a discussion on such a relation between R. C. Purdy and G. D. Phillips.)

R. C. PURDY: The American Ceramic Society encourages Local Sections where overlapping of local interests are not prevalent.

G. D. PHILLIPS: Should keep entirely apart from the New York State College of Ceramics.

S. R. SCHOLES: Should make a study of the scope of influence and interests. Such an organization would be a great service to the New York State College of Ceramics even if it is not a stated purpose.

J. T. LITTLETON: Proposed the direct question, "Will it be worth while?" "Will it be good for The American Ceramic Society and also local members?"

It should help broaden the field of activity of The American Ceramic Society because it would give opportunity to more men to participate in Society activities because a Local Section would hold frequent meetings, thereby enabling the various plants to allow their men to take turns in attending. Felt many replies to M. E. Holmes were of a group nature representing many more than those actually received. Stated that the organization should be sponsored by a very interested individual who has time and energy to take it over. Believed someone from Alfred should be the one as it would benefit them considerably. Could be of great value to Society members who cannot attend Annual Meetings.

ARTHUR FALTER: Would draw many men who have no other local organization to interest themselves in.

H. D. PRIOR: Concluded that the group seemed to want to form and stand alone on both a technical and social basis. Territorial limits as now set up would offer unlimited possibilities for programs.

PAUL WHELAN: Would give a chance to meet others in industry. Should not be too technical.

J. A. PROE, JR.: National Meeting is too difficult to attend for younger and less influential men.

J. F. MCMAHON: Favored a group as such to further purposes of The American Ceramic Society and boost young men in industry.

EVERETT THOMAS: Would give men a chance for a day off from work after the past year's pressure.

It was then moved and seconded that the group establish itself as the Upstate New York Section of The American Ceramic Society and apply to The American Ceramic Society for a charter. Motion was carried by acclamation.

Ross Purdy offered to submit material covering suggested mode of organization and by-laws.

A motion was passed to establish an organization committee of three to prepare plans and to arrange for a future meeting for nomination and election of officers; also to invite the President of The American Ceramic Society.

The motion was amended to the effect that the present Chairman be continued until the next meeting.

It was recommended that (1) the committee be representative of all sections; (2) the committee decide the time and place of the next meeting; (3) the committee either nominate or appoint a nominating committee; (4) the committee or elected officers obtain an up-to-date list of Society members in this section.

A motion was passed to take up a collection from members present to cover nominal expenses of the committee.

Ross Purdy offered to have minutes of this meeting manifolded by the Columbus office.

Meeting adjourned by motion.

Respectfully submitted,
E. E. KUNZMAN
*Temporary Secretary*

# NOTES FOR CERAMISTS

## PORCELAIN ENAMEL INDUSTRY STUDIES NEW PROCESSES

Dielectric heating and induction heating for drying and fusing porcelain enamels are two suggested changes in porcelain enamel processing. These methods of heating may have revolutionary effects upon the application of porcelain finishes. Although such work has not been done previously, the importance in other fields indicates that such methods may be possible.

The use of multiple or repeat tanks in cleaning operations and electrolytic cleaning has been suggested. The technicians in this industry agree that better cleaning is important and point to the results which have been secured for other coating processes such as plating. The possibility of producing perfectly clean working surfaces on iron or steel sheets has been a matter of long development in the porcelain enamel industry.

Atmospheric control of furnaces is progressing with great rapidity, especially when the protective nature of the porcelain enamel coating is important. The manufacture of water tanks and other containers has been the proving ground for this important method of application. The surface produced seems to be completely free of the usual irregularities.

Air cleaning, both as a matter of process control and for the recovery of materials, is receiving increasing attention. The proper preparation of air for spraying improves the application of the coating. In the recovery of materials from spray-booth exhausts, some processes reclaim almost 100% of the losses.

Electrolytic precipitation of porcelain enamels in spraying, according to many engineers, will result in large reduction in materials used. It will also make application much more complete and uniform and tend to reduce the loss resulting from irregular or thick coatings. This process, already in use in other industries, is receiving extensive engineering study in the porcelain enamel industry.

The importance of research work in these fields has led the Porcelain Enamel Institute to establish a Committee on Process Development to study new manufacturing methods and report on their adaptability to this industry. This Committee consists of Chairman L. E. Nordholt, vice-president, Tennessee Enamel Mfg. Co., Nashville, Tenn.; H. D. Carter, research engineer, The Harshaw Chemical Co., Cleveland, Ohio; R. M. King, associate professor, Department of Ceramic Engineering, Ohio State University, Columbus, Ohio; Edward Mackasek, development engineer, Porcelain Enamel Institute, Washington, D. C.; A. I. Andrews, Head, Department of Ceramic Engineering, University of Illinois, Urbana, Ill.; J. W. Hoehl, vice-president, Wolverine Porcelain Enameling Co., Detroit, Mich.; G. W. Dykstra, engineer, Great Lakes Steel Corp., Detroit, Mich.; R. E. Taylor, general superintendent, The Enamel Products Co., Cleveland, Ohio; and F. R. Porter, engineer, Inland Steel Co., Indiana Harbor, Ind.

The first meeting of this Committee, held on January 18 at Cincinnati, Ohio, laid out a specific program of inquiry and assigned one new process to each member for further study. Subsequent meetings will be held to develop a final report to the industry and make recommendations for additional research work in the field of manufacturing methods.

The Committee agreed that the processes of applying porcelain enamel were in need of critical examination at the present time. Engineering advance in the finishing field has been rapid and processes not subject to continuous research will be superseded in future production. The Porcelain Enamel Institute is urging all manufacturers in the industry to follow the reports of this Committee and make changes in processing methods which are dictated by the rapid improvements in this field.

The tremendous tonnage of iron and steel sheets to be finished with porcelain enamel for domestic appliances during the postwar period will tax the manufacturing capacity of the industry. Improvements in manufacturing processes will make possible the rapid production of material for the peacetime market without extensive installations of new equipment.

**P.E.I. PROCESS DEVELOPMENT COMMITTEE**
*Clockwise:* H. D. Carter, R. M. King, C. S. Pearce (managing director, P.E.I.), Edward Mackasek, A. I. Andrews, J. W. Hoehl, G. W. Dykstra, R. E. Taylor, and F. R. Porter. Chairman Nordholt was not present.

## TESTIMONIAL DINNER FOR G. E. BARTON

A testimonial dinner was held January 25, 1944, in honor of George Estes Barton, chief chemist emeritus of the Armstrong Cork Company plant at Millville, N. J. Mr. Barton retired from active work in the Millville plant January 1.

Members from Lancaster, Pa., attended the dinner, held in Millville, as did five past-presidents of the Philadelphia Branch of the American Chemical Society. Also attending were A. K. Lyle and V. C. Swicker of the Hartford-Empire Co., Hartford, Conn., and E. L. Hettinger of the Willson Products, Inc., Reading, Pa.

Everyone enjoyed the evening, during which Mr. Barton's praises were sung without "piling it on too thick," he receiving well-earned credit for his accomplishments, accomplishments which were reviewed in a recent issue of *The Bulletin* (see January, 1944, pp. 1–4).

Yes, George E. Barton has retired from active work but, as recorded in the January issue of *The Armstrong Reporter*, "his retirement will not take him out of circulation and his influence will continue to be felt, for he has made a lasting contribution to the Millville plant and to glass production generally. He has written his name indelibly in the history of American science and industry."

## DR. SILVERMAN TO SPEAK FOR CLEVELAND FINE ARTS ASSOCIATION

On April 13, 1944, the Cleveland Fine Arts Association will present Alexander Silverman, head of the Department of Chemistry, University of Pittsburgh, Pittsburgh, Pa., who will speak on the subject "Glass After the War."

The lecture, to be illustrated with slides and apparatus, will be held in the auditorium of the Board of Education Building, East 6th and Rockwell, Cleveland, Ohio.

Tickets may be obtained (no charge) from the president of the Association, Mrs. Mabel L. Bullis, Cleveland Museum of Art, Station E, Cleveland, Ohio.

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# PROPOSED TEST FOR ADHERENCE OF ENAMEL TO CAST IRON*

By W. C. Cress and H. G. Fisk

Abstract

A summary is presented of the more important physical characteristics influencing the adherence of enamels to cast iron. Enamels on a cast-iron surface are normally under a slightly compressional stress; by progressively increasing this stress until enamel flies from the surface of the plate, the relative adherence of the enamel to the plate may be measured. Preliminary experiments have proved the soundness of the theory, and a technique has been developed for carrying out the test and obtaining results reproducible within fairly close limits. Data are given to show the general effect of time of slush-coat firing and other factors on the adherence of a dry-process enamel.

## I. Introduction

During the progress of an investigation of cast-iron enamels it was found desirable to develop a means for measuring the adherence of enamel to cast iron. After a trial of tests that have already been proposed or published, the test here described was evolved. Although time has not permitted as much work as desirable on developing and extending this test, the authors found it useful and are presenting the method and a few preliminary results with the thought that it may be of use to others even in its present form.

One of the chief complaints against porcelain enameled ware in shipment and service is chipping or "lifting" of the enamel from the iron. A suitable quantitative test measuring the forces necessary to cause this type of failure has not been reported. Several methods have been developed for testing enamel adherence to sheet iron and steel, and attempts have been made to apply such procedures as the falling-weight and the pendulum-impact tests to cast iron. Enamel failure on sheet iron and steel is caused, however, by deformation of the metal which is usually not obtained in the tests so far proposed for cast-iron enamel adherence. In the latter case, an impact test measures the brittleness of the enamel rather than its adherence, for the base metal is approximately $^1/_4$ in. thick and no appreciable bending or flexing takes place. For this reason, direct-impact tests were eliminated from consideration in favor of a test whereby a deformation of the enameled metal could be obtained.

Harrison and Thaler[1] describe a test in which two plates are fired and the enameled faces are pressed together with suitable tongs in the furnace as soon as boiling has ceased. After cooling under annealing conditions, the forces necessary to pull the pieces apart are measured. Andrews,[2] reporting on this test, pointed out that failure usually occurred in the enamel rather than in the enamel-metal bond, and the results could not be considered strictly as a measure of adherence.

## II. Theoretical Considerations

Normally, after cooling, the enamel layer on an enameled casting is under slight compressional stresses because of the greater coefficient of expansion of the metal as compared with that of the glass. Consequently, after the glass has become rigid or unyielding in cooling, the metal shrinks more than the enamel and causes the enamel to be under this compressional stress. The ideal enamel-metal condition is one in which the enamel is under only sufficient compressional stresses to insure freedom from possible tensional stresses which might result in crazing at any spot on the ware, over the normal temperature ranges encountered in use. A test in which compressional stresses are gradually increased until failure takes place should enable comparison of various enamel-metal bonds.

The compression test to be described was developed to produce a shear force at the bond between the enamel glass layer and the iron and to increase the shear stress progressively until failure of the bond resulted. These counteracting or shearing stresses were obtained by applying opposing forces to the opposite edges of the iron, as illustrated in Fig. 1.

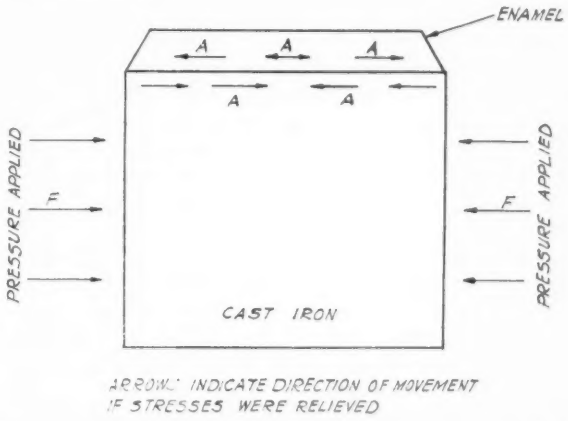



Fig. 1.—Schematic representation of stresses in enameled cast-iron plate under compression.

The forces $F$ in Fig. 1 exerted on opposite parallel edges of the specimen compress its outer edges toward the center. The rigidity of the enamel opposes the deformation of the metal, inducing the shear forces $A$. The enamel must yield to the compression forces or its bond to the iron is sheared. As the magnitude of the forces $F$ increases, the enamel

* Presented at the Forty-Fourth Annual Meeting, The American Ceramic Society, Inc., Cincinnati, Ohio, April 21, 1942 (Enamel Division). Received March 4, 1943; revised paper received April 18, 1943.

[1] W. N. Harrison and G. T. Thaler, "Test for Adhesiveness of Vitreous Enamels to Metal," *Jour. Amer. Ceram. Soc.*, **11** [11] 803–11 (1928).

[2] A. I. Andrews, Enamels, pp. 355–56. Twin City Printing Co., Champaign, Ill., 1935; *Ceram. Abs.*, **14** [6] 158 (1935).

breaks away from the edges toward the center or neutral axis (Fig. 5(*A*)).

### III. Development of Test

The preliminary investigations were made with round rods $^3/_4$ in. in diameter. Long round bars were enameled, from which specimens 2 in. long were cut and used for compression tests. The forces applied to the bar ends, however, not only gave the shear effect shown in Fig. 1, but compression tended to increase the diameter of the bar. This resulted in circumferential tensional stresses at the metal-enamel interface, as well as longitudinal compressional stresses along the axis of the specimen. These opposing stresses would make interpretation of failures difficult.

With further development, a specimen of this shape may have application in studying the mechanics of cast-iron enamel adherence. In work connected with the development of this test, however, a flat specimen was chosen to eliminate as many variables as possible. With cast-iron plates approximately $^1/_4$ in. thick, specimens 2 in. square could be compressed without bending or twisting the metal, as occurred with a larger test piece.

Specimens were cut from small flat castings with a silicon carbide cutoff blade before sandblasting and enameling. Test pieces were also cut from flat enameled ware with a suitable jig. The enamel was burned back from the edges of the test pieces cut before enameling. Those cut from fired ware required that the enamel be ground off at a taper $^1/_8$ in. from the edge. This method of cutting produced specimens with smooth parallel edges.

Preliminary tests were made by cutting the edges of the test plates at right angles to the flat face, grinding them flat, and using ball-platens for uniform pressure application. The compression force was obtained with a hydraulic press of 28,000 lb. total force. Trouble was encountered in centering the axis of the specimen with the axis of the ball-platens and keeping the face of the test piece parallel to the direction of force. The iron would bend into an S shape with any degree of variation from perfect alignment.

As the opposite edges of the specimens were almost perfectly parallel from cutting, a rocker-platen (see Fig. 2) was used to equalize the pressure across the face of the test piece. To overcome any slight irregularities in the end surfaces of the test plate, thin lead strips were used to cap the top and bottom ends of the specimens but were found to be too soft.

Sixteen-gauge copper strips which had been softened by heating and chilling in cold water were satisfactory for capping specimens. As force was applied to the copper strips, they became hardened after taking the shape of the contact surface and resulted in uniform distribution of load over the contact surfaces.

In most cases, these strips could be reannealed and used for as many as six specimens. As the compressional load was applied in a vertical direction, alignment of the specimen was checked by sighting across its face to the string of a plumb bob.

As deformation of cast iron in compression appears to be a function of time as well as load and, in this case, adherence failure is caused by deformation of the iron, it was necessary to use a given rate of load application in all cases. Employing test pieces 2 in. square, the load found to give

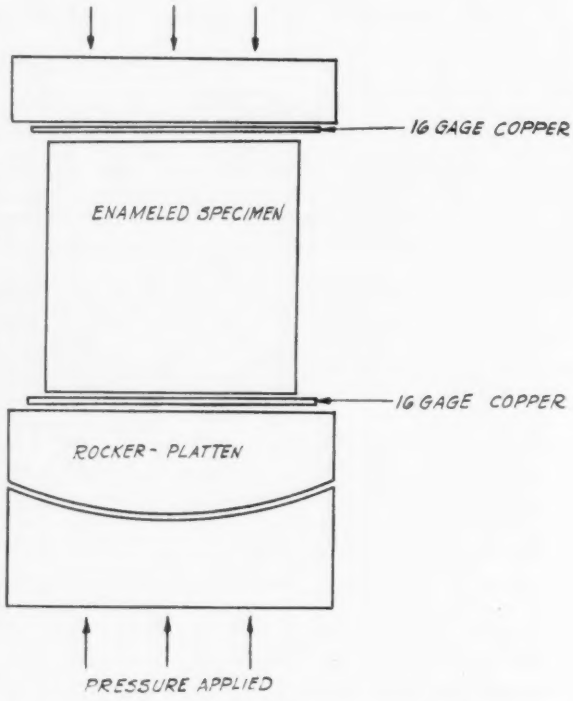



FIG. 2.—Diagram showing rocker support for enameled specimen and load application.

good results was 2000 lb. per $^1/_4$-in. thickness per 30-sec. interval. The thickness of each test piece was measured to the nearest $^1/_{64}$ inch, and a loading schedule calculated to 2000 lb. per $^1/_4$-in. thickness was used.

This test will give reproducible results when the following conditions are met:

(1) Iron samples must be from the same stock and preferably from the same casting with the chilled edges removed before cutting specimens.

(2) Surface preparation of the specimens must be standardized.

(3) Ground-coat application must be standardized at the optimum weight of application; this condition is more important than generally recognized.

(4) Cover-coat application must be standardized in accordance with good enamel practice.

Erratic results, when these factors are maintained, are in themselves an indication of differences or imperfections in the iron stock.

Results obtained indicate that excessive cover-coat thickness tends to decrease enamel adherence.

### IV. Application of Compression Test

Some typical results obtained in the study of ground-coat firing are shown in Figs. 3 and 4. The ground coat was uniformly sprayed at constant application weight from specimen to specimen. A two-application cover coat was used at constant thickness from specimen to specimen. Figure 5 shows typical failures of specimens.

The compression test for adherence promises to be a valuable tool in obtaining quantitative data in the study and development of dry-process enamels such as (1) firing ranges of ground coats; (2) comparison of ground-coat

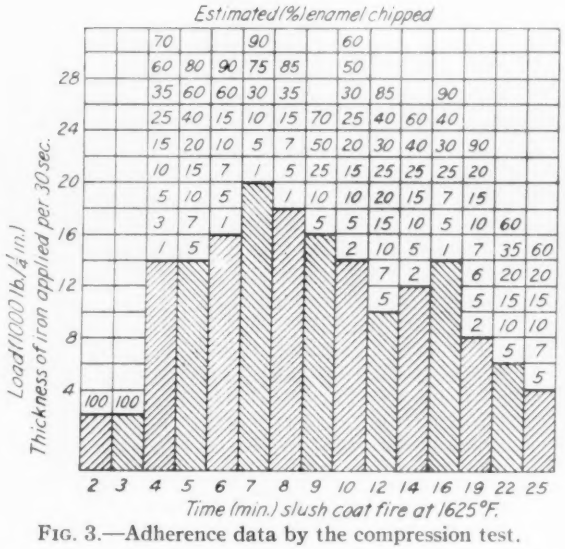



FIG. 3.—Adherence data by the compression test.

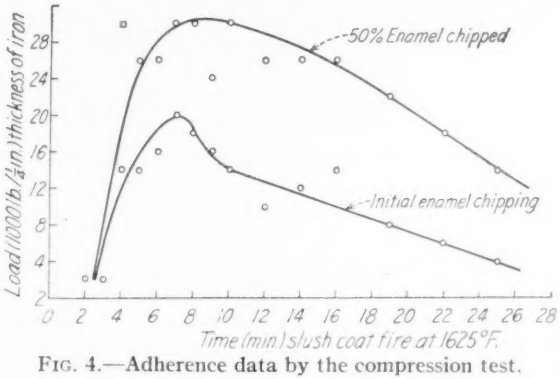



FIG. 4.—Adherence data by the compression test.

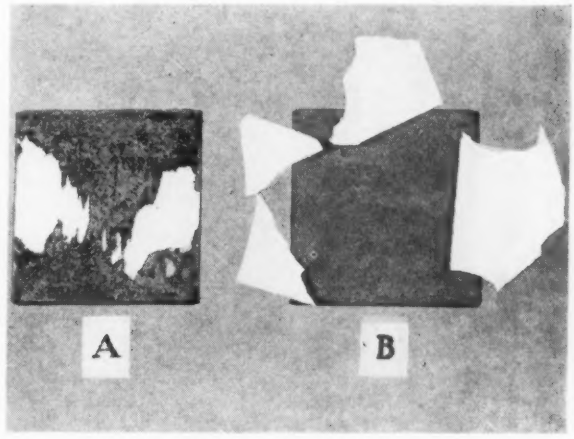



FIG. 5.—Typical failures of enamel specimens. (*A*) Specimen with good adherence: enamel failure in compression has taken place partly in the ground coat-enamel bond and partly in the ground coat-metal bond; loading was in the vertical direction, i.e., on the edges free of cover coat. (*B*) Specimen with poor adherence: complete enamel-metal bond failure took place under low compressional loading.

compositions in respect to adherence; and (3) differentiation between types of iron surfaces in respect to adherence.

**Acknowledgment**

The authors express thanks to T. C. Poulter, Scientific Director of Armour Research Foundation, who suggested the proposed test, for counsel and aid in carrying out the work reported.

ARMOUR RESEARCH FOUNDATION
THIRTY-THIRD, FEDERAL, AND DEARBORN STREETS
CHICAGO, ILLINOIS

# PLANS AND SPECIFICATIONS FOR A SMALL GLOBAR KILN*

BY EDGAR LITTLEFIELD

ABSTRACT

Many schools and individuals desire simple plans for an electric kiln. A description of such a kiln is given, together with a set of plans and specifications.

## I. Need for Suitable Kiln

During the past several years, the design of small electric kilns suitable for use in schools and small ceramic studios has been of major interest in the Department of Fine Arts at the Ohio State University.

There are available, or were, until war demands curtailed their production, several types of electric kilns of varying desirability. Some were too small for most purposes. Many lacked durability and seemed to be always in need of repairs, and nearly all were too costly. In many cases, the high cost of these kilns was the result of incorporating in their designs refinements and equipment which had great eye-appeal but which contributed little or nothing to the kilns' efficiency.

Recognizing some of these difficulties, many teachers and studio workers desire to construct their own kilns and have thus created a demand for a set of plans and specifications in which simplicity of construction and operation is the keynote.

## II. Development of Present Type

Several kilns have been built in the course of the experiments. Some of these were of a decidedly temporary nature and some are permanent installations. Some employed wire-heating elements and some used the Globar nonmetallic heating elements, which are preferable for general purposes because it is possible to use

* Presented at the Forty-Fifth Annual Meeting, The American Ceramic Society, Inc., Pittsburgh, Pa., April 21, 1943 (Art Division). Received April 22, 1943.

See also "Symposium on Small Kilns and Ceramic Craft Work," *Bull. Amer. Ceram. Soc.*, **15** [3] 116–28 (1936) and "Electric Kiln for Pottery Firing" by F. H. Norton, *ibid.*, **19** [12] 463–64 (1940).

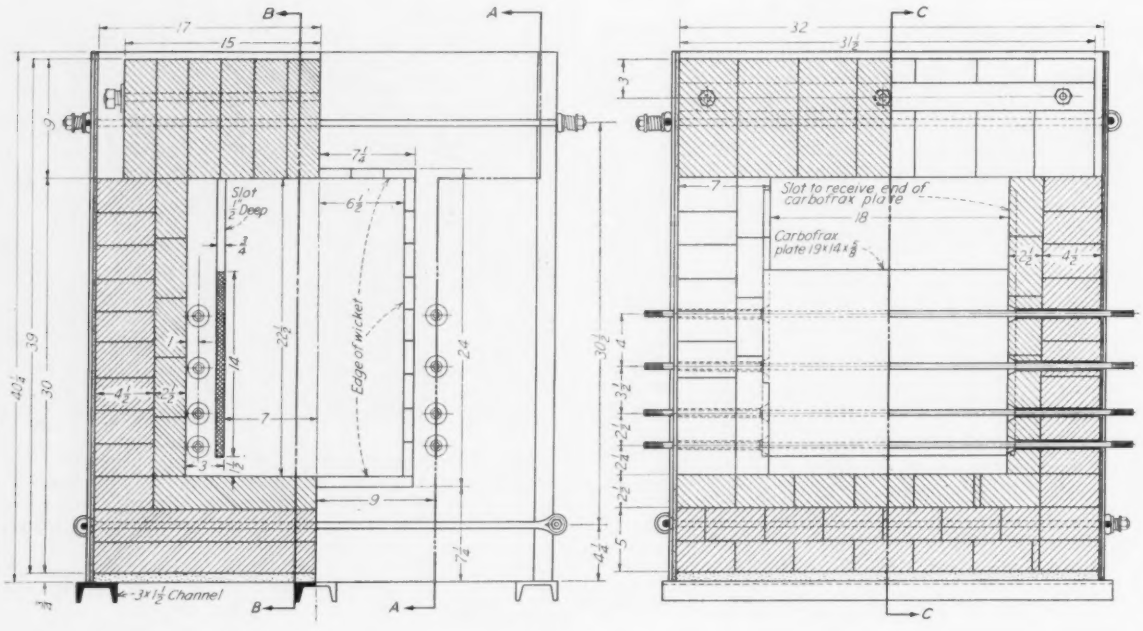



FIG. 1.

them for temperatures ranging from decorating heats to porcelain requirements. Each kiln constructed included improvements over previous kilns. The kiln for which plans are here offered (see Fig. 1) represents the present stage in the development.[1] It is not claimed that this kiln represents the ultimate in electric kiln construction. We shall continue to develop kilns, and we expect our next kiln to be better than this one.

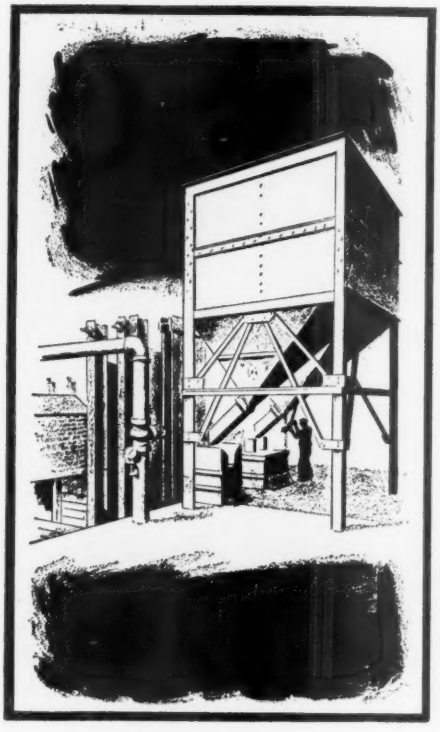
The design provides a firing chamber of 3.2 cu. ft. Its interior height allows the firing of pieces up to 20 in. tall, and the width will accommodate bowls 13 in. in diameter.

The heating elements are protected from mechanical breakage by Carbofrax plates which serve also as baffles to induce convection and subsequent distribution of heat. The Carbofrax plates serve the additional purpose of diffusing the radiant heat of the elements, thereby protecting the ware from local "hot spots."

The kiln is heated by two separate circuits. In operation, the kiln is started on one circuit and allowed to heat gradually. A definite ceiling temperature (about cone 03) can be reached on one circuit only in about 10 hours. If a temperature above cone 03 is desired, the second circuit is placed in operation and the kiln is brought to the maturing temperature in a few additional hours. This double-circuit arrangement is of distinct advantage in the firing of high-temperature ware because the operator can start the kiln in the evening and be assured that the temperature will rise slowly during the night and be at the proper temperature for speeding up the next morning.

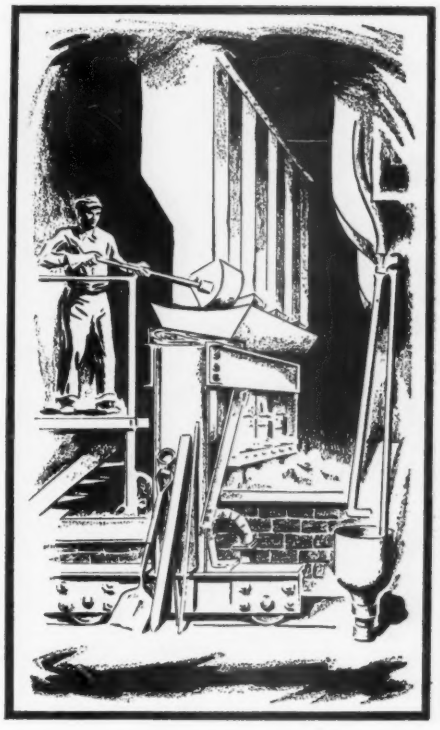
[1] Complete plans and specifications are available at the Department of Fine Arts, The Ohio State University, Columbus, Ohio.

DEPARTMENT OF FINE ARTS
OHIO STATE UNIVERSITY
COLUMBUS, OHIO



DO NOT CHARGE THIS WAY

BUT

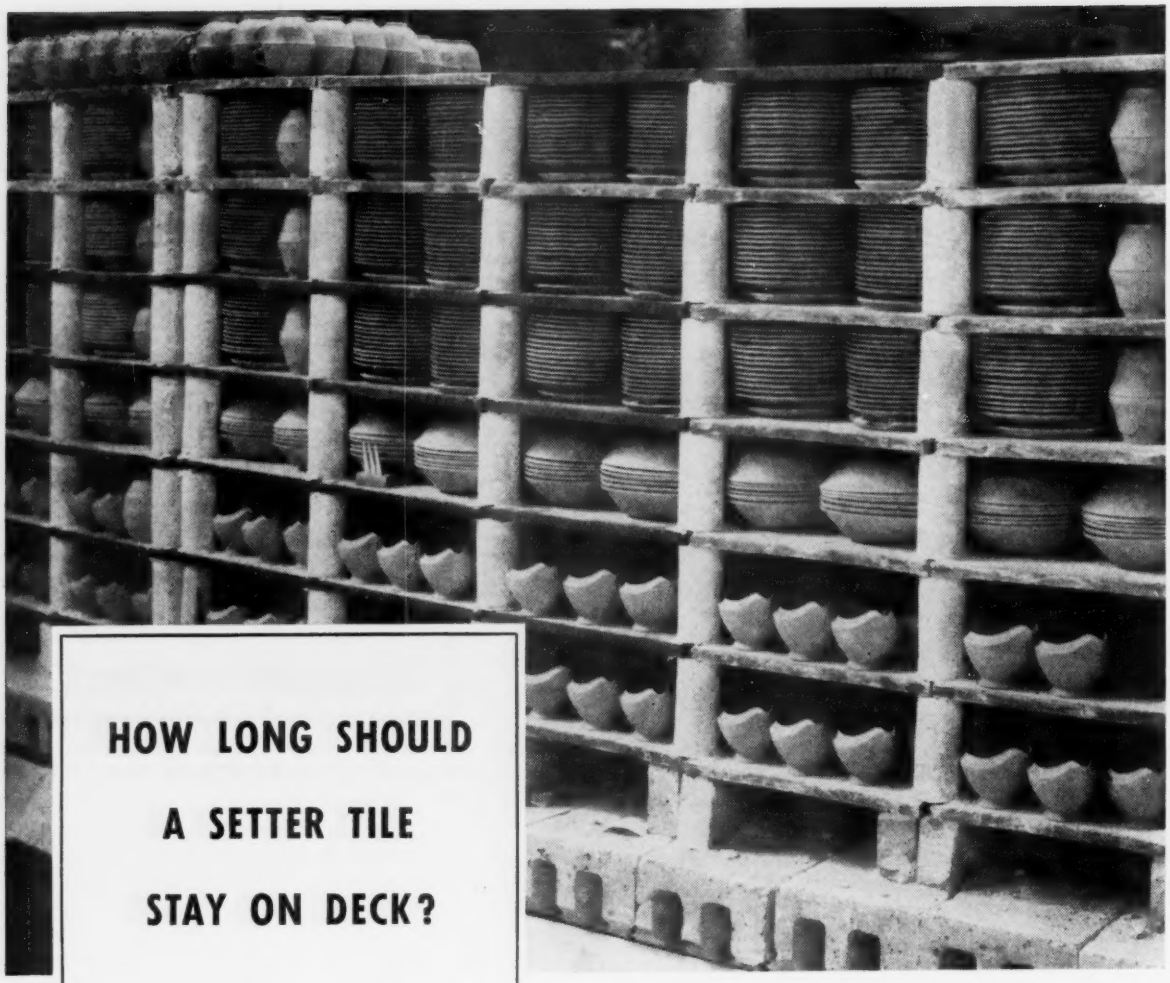


CHARGE THIS WAY FOR QUALITY GLASS

If you want to make better glass with lower operating costs, use the SIMPLEX Blanket Method of Feeding the Raw Materials to your Tank Furnace, as shown above.

A SIMPLEX Representative can help you in this connection.

**FRAZIER-SIMPLEX, INC.**
**ENGINEERS**
**436 EAST BEAU STREET • WASHINGTON, PENNA., U.S.A.**



## HOW LONG SHOULD A SETTER TILE STAY ON DECK?

THE "Carbofrax" setter tile shown in this picture are typical. Here's the story.

In a plant making semi-vitreous ware, setter tile of "Carbofrax," the Super Refractory by Carborundum, were used in the setting shown in the photograph. This setting made 356 trips through the kiln without repairs. When replacements were necessary, enough tile were saved to make up the two upper decks, which ultimately made 512 trips before they were removed from service. The temperature was cone 10 tipped. The schedule was an average of 72 hours. And the average load was 35 lb. per setter tile.

Through the use of "Carbofrax" setter tile, the life of your superstructure can undoubtedly be increased. Write us and one of our engineers will be glad to consult with you. The Carborundum Company, Refractory Division, Perth Amboy, N. J.

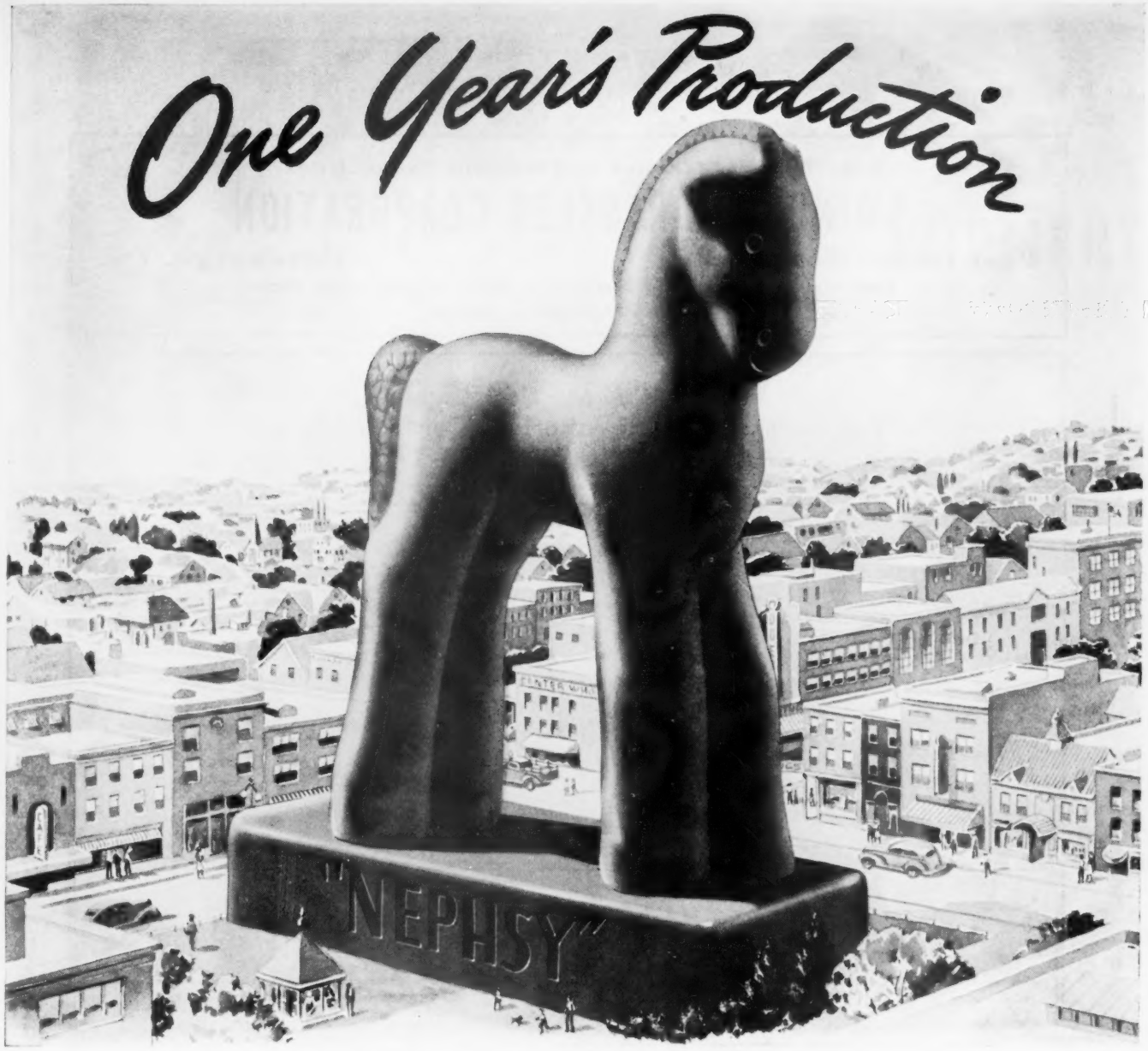
REFRACTORY CARBORUNDUM PRODUCTS

District Sales Branches: Chicago, Philadelphia, Detroit, Cleveland, Boston, Pittsburgh. Distributors: McConnell Sales and Engineering Corporation, Birmingham, Ala.; Christy Firebrick Company, St. Louis, Mo.; Harrison & Company, Salt Lake City, Utah; Pacific Abrasive Supply Company, Los Angeles, San Francisco, Calif.; Denver Fire Clay Company, El Paso, Texas; Smith-Sharpe Company, Minneapolis, Minn.

**Super Refractories by CARBORUNDUM** TRADE-MARK

(Carborundum and Carbofrax, are registered trade-marks of and indicate manufacture by The Carborundum Company)

# One Year's Production




## of LAKEFIELD NEPHELINE SYENITE

would really make a ceramic statue of this size. The growth in acceptance of Lakefield Nepheline Syenite has really been so great that new production facilities are, of necessity, under way. Consider these advantages:—

GLASSWARE: The use of Nepheline Syenite in the glass batch makes possible a higher aluminum oxide content without increasing the melting temperature. The low iron oxide content is an important factor where color is an important consideration.

LOW TEMPERATURE VITREOUS BODIES: These new bodies are rapidly replacing the old high fired bodies in many plants which make floor tile, art ware, sanitary ware, dinnerware and many other types of vitreous ware. The bodies mature at Cones 3–4 and are unusually strong and free from warpage. Increased production is made possible by the fast firing cycle and, of course, there is a big saving in fuel and refractories.

GLAZES: New glazes have been developed which mature at Cone 01 and are made to fit the new low temperature bodies. These glazes are of fine texture, high gloss, and the scratch and acid resistance of these glazes meet the exacting requirements of the maker of fine dinnerware.

Write us regarding your production problems.

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Mailing address: 1526 Canada Blvd., Glendale, California

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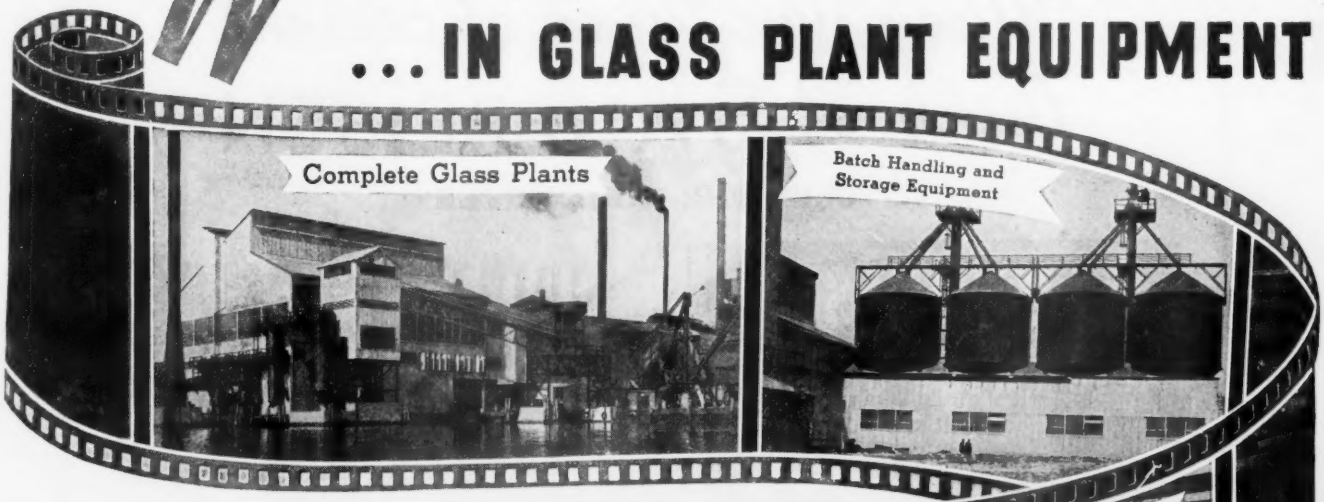


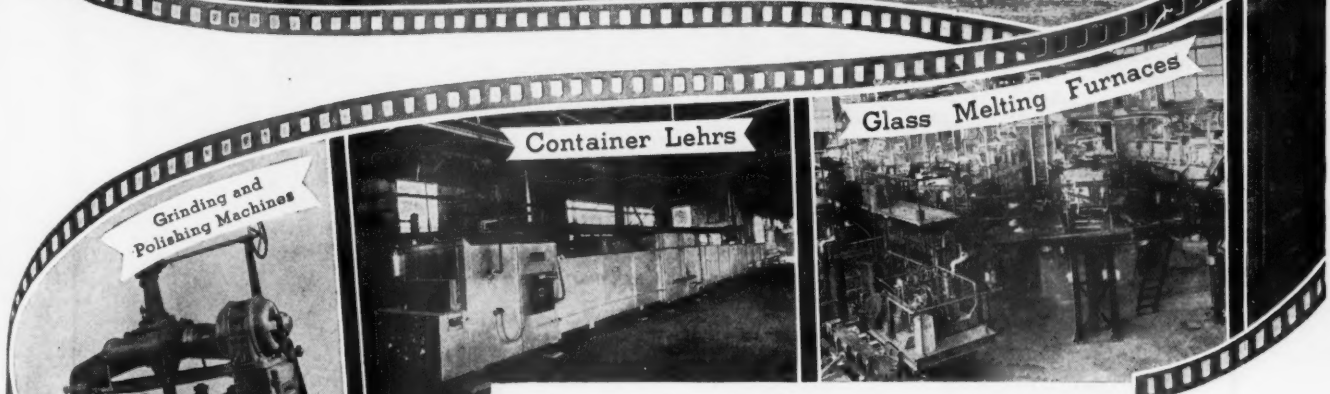


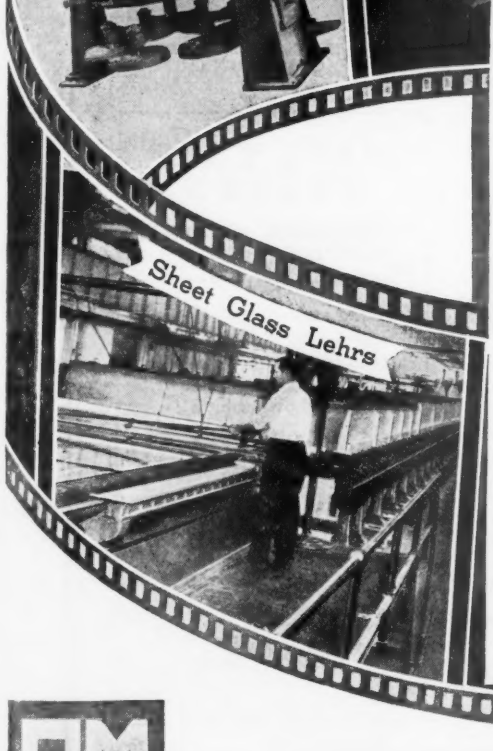


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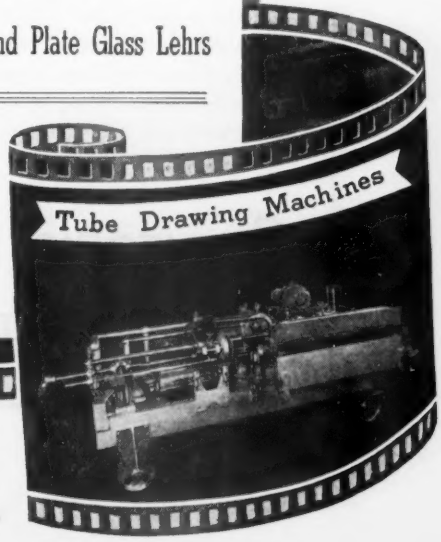


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"A quick-setting cement which trowels cold, resists acids (except hydrofluoric), water, oil, high temperatures and most solvents. It is particularly useful for laying brick exposed to acids, gases, etc."

"Special technical cements and compounds for electrical insulation, factory assembling, pipe jointing, sealing, heat treating, etc."

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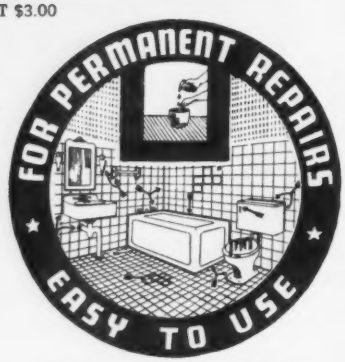


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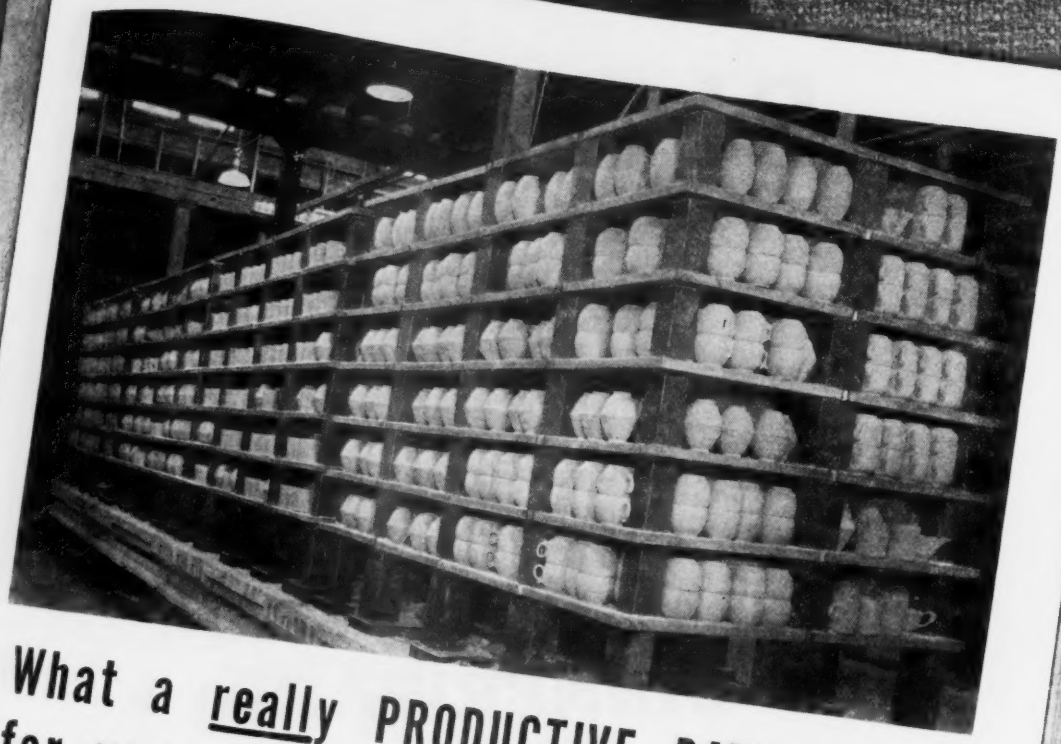

# What a really PRODUCTIVE BATT Can do for your volume and cost figures . . . . .

"Productive Batts" in pottery parlance are Electro Batts. They are more than operating equipment — *they directly increase production and decrease costs per unit in this manner:*

- **More ware can be handled per cubic foot of kiln car.** Tremendous strength of batts permits manufacture in thin sections.
- **Fewer posts required in car setting.** Here again—it's strength that permits the use of larger batts without danger of breaking or warping.
- **Longer batt life.** High resistance to thermal shock prevents cracking on repeated heating and cooling cycles.
- **"Seconds" held to a small number.** True, straight ware not threatened by cracking or sagging.

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# DENISON

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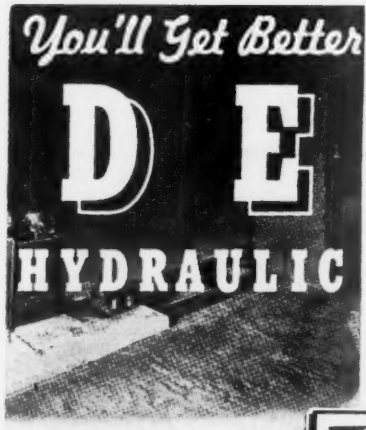

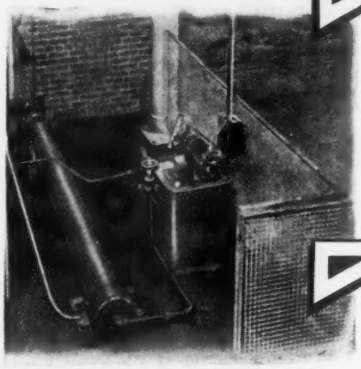

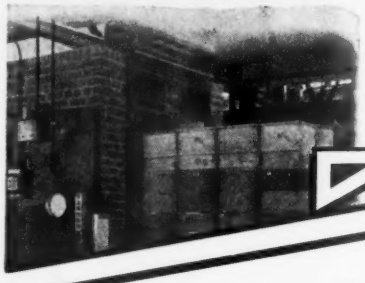

When it comes to production problems, the *best* way to do the job is *always* the most economical in the long run—and usually the most profitable.

That's especially true when it comes to problems of movement-control, where accuracy and dependability are absolutely essential. If, for instance, a car propeller fails to function, the kiln is out of production . . . if it operates erratically, the quality of the fired products is lowered considerably—and either result can be very costly.

Here's the answer to your question of "How can WE be sure of getting the best movement-control equipment?" Avail yourself of the technical knowledge and skill gained through years of specialized experience by the *leaders* in the field of designing and building such equipment. Call Denison. Consultation involves no obligation.

*Denison Car Propellers*

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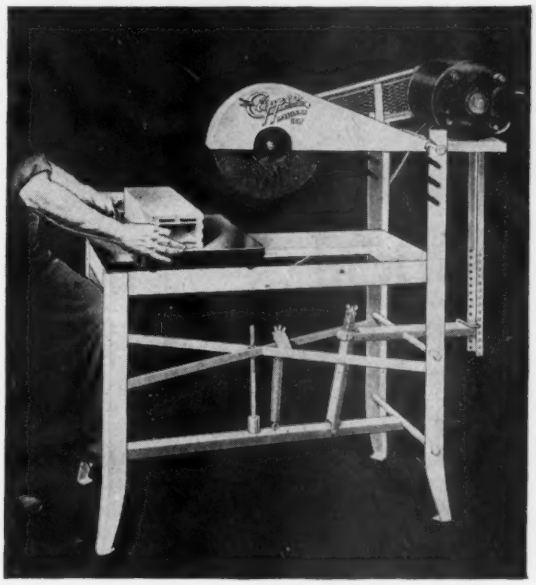
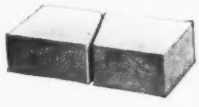
# FASTER CUTTING...with Clipper Masonry Saws

**Your Special Size and Shape Brick or Tile can now be "Tailor-Made" at a moment's notice!**

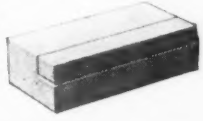


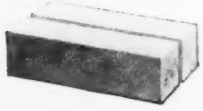
**The new Clipper Multiple Cutting Principle makes possible faster cutting of every masonry material regardless of hardness. Here are a few typical examples:**



This acid brick intended for a chemical plant acid chamber was cut completely in two, in just 37 seconds.

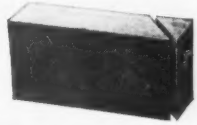
One of many intricate cuts performed on first quality clay brick for heat treating furnaces. Made in 8 sec.





Silica brick cut lengthwise for open hearth furnace work, only 9 seconds were required to complete this cut!

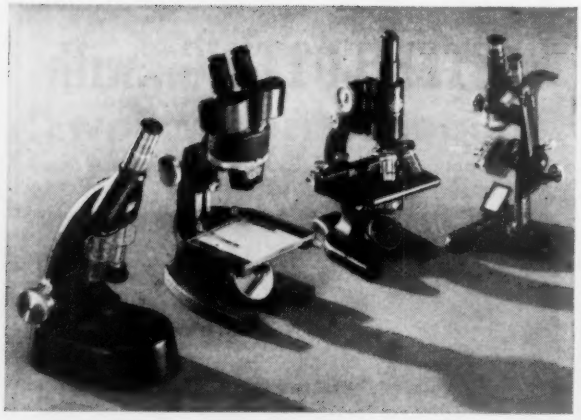
Basic refractories for steel furnaces or cement kilns must be accurately installed. This magnesite brick was cut in 12 seconds.



**Clipper Saws are available for trial. Write for Descriptive Catalogs.**

THE Clipper MANUFACTURING COMPANY

**4007 CHOUTEAU • ST. LOUIS, MO.**



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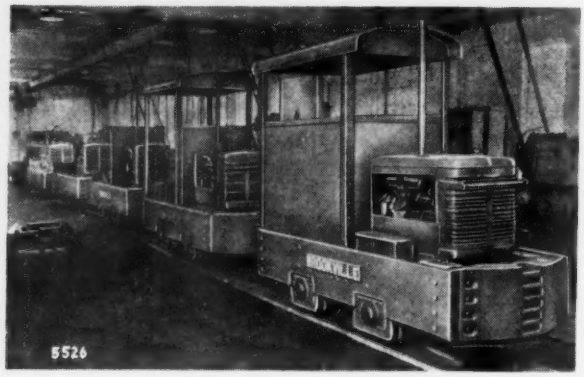


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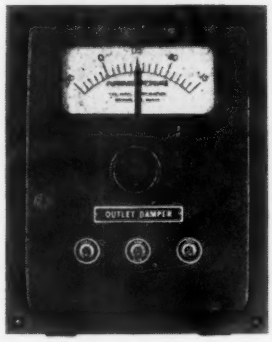
# CONTROL AND YOU Save!

Below is pictured the Hays Automatic Tank Pressure Controller Type CDE-X which is typical of Hays Controllers. It is provided with a manual adjusting knob accessible from front of case for setting the Controller for the differential pressure to be maintained. Indicator and scales indicate differential or furnace pressure for which the Controller is set.




SAVE in time, materials, fuel, man-power; minimize spoilage and guarantee a better, more uniform product.

Hays Instruments for the Ceramic Field include air and gas measuring, indicating and recording Gages, draft and pressure Indicators and Recorders, Gas-Air Ratio Meters, Oil-Air Proportioning Meters, Combustion Meters, $CO_2$ Recorders and complete Systems of Automatic Combustion Control.

Bulletins 43-552 and 43-591 explain the application of Instruments and Controllers to Ceramic furnaces, Glass tanks, Pottery kilns and Enameling furnaces with schematic drawing of a complete system of Automatic Control of Combustion and Pressures—sent free upon request.

SPECIAL NOTE! Be sure to send for your Free Copy of Bulletin 43-552 "Instrumentation and Control of Ceramic Furnaces, Pottery Kilns, Glass Tanks and Enameling Furnaces."

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By producing accurate pyrometric cones.
By financing ceramic research.

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(c) The head of the Engineering Experiment Station of the Ohio State University.

(d) The head of the Department of Ceramic Engineering of the Ohio State University.

(e) The Secretary of The American Ceramic Society.

(f) One representative of The American Ceramic Society other than the Secretary, to be appointed by the Board of Trustees of said Society, for a term of three years.

(g) A reputable Attorney-at-Law, to be selected by the Probate Court of Franklin County, Ohio.

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Harshaw Chemical Co.
Norton Co.
The Vitro Mfg. Co.

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Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
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**Ammonium Carbonate**
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The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

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Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
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Metal & Thermit Corp.
The Vitro Mfg. Co.

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The Vitro Mfg. Co.

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The Hommel, O., Co., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
The Vitro Mfg. Co.

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Chicago Vitreous Enamel Product Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Foote Mineral Co.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

**Basic Oxides**
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Pemco Corp.

**Batch Systems**
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Norton Co. (*Alundum-Crystolon*)

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Hammill & Gillespie, Inc.

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Harshaw Chemical Co.
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Potters Supply Co.

**Blocks (Refractory)**
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Corhart Refractories Co.
Electro Refractories & Alloys Corp.
Norton Co.
The Vitro Mfg. Co.

**Body Stains**
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
The Hommel, O., Co., Inc.

**Bone Ash**
Ceramic Color & Chemical Mfg. Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

**Borax**
American Potash & Chemical Corp.
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
Pacific Coast Borax Co.
Stauffer Chemical Co.
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**Borax Glass**
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Pacific Coast Borax Co.
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**Boric Acid (Anhydrous)**
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Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Pacific Coast Borax Co.
Stauffer Chemical Co.
The Vitro Mfg. Co.

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Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
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**Cadmium Sulphide**
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Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

**Carbofrax (Refractory Products)**
Carborundum Co.

**Carbonates (Barium, Lead)**
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Foote Mineral Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

**Castings**
Lancaster Iron Works, Inc.

**Caustic Potash**
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Solvay Sales Corp.

**Caustic Soda**
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Pennsylvania Salt Mfg. Co.
Stauffer Chemical Co.
The Vitro Mfg. Co.

**Cements**
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Corhart Refractories Co.
Electro Refractories & Alloys Corp.
Green, A. P., Fire Brick Co.
Norton Co.
Pennsylvania Salt Mfg. Co.
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Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
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Harshaw Chemical Co.
The Hommel, O., Co., Inc.
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Pennsylvania Salt Mfg. Co.
Porcelain Enamel and Mfg. Co.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

**Cerium Oxide**
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Drakenfeld, B. F., & Co.
Foote Mineral Co.

**Chromite (Natural Chromate of Iron)**
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Foote Mineral Co.

**Chromium Oxide**
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Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Ferro Enamel Corp.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Pemco Corp.
The Vitro Mfg. Co.

**Clay (Ball)**
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Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
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Maxson, Elwyn L.
Potters Supply Co.
Spinks, H. C., Clay Co.
United Clay Mining Co.
The Vitro Mfg. Co.

**Clay (Bentonite)**
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Chicago Vitreous Enamel Product Co.
Foote Mineral Co.
Great Lakes Foundry Sand Co.

**Clay (Block)**
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.

**Clay (China)**
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Maxson, Elwyn L.
Spinks, H. C., Clay Co.
United Clay Mining Co.

**Clay (Enamel)**
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Ferro Enamel Corp.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
Kentucky Clay Mining Co.
Maxson, Elwyn L.
Metal & Thermit Corp.
Pemco Corp.
Spinks, H. C., Clay Co.
Titanium Alloy & Mfg. Co.
United Clay Mining Co.
The Vitro Mfg. Co.

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Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Kentucky Clay Mining Co.
Pemco Corp.
The Vitro Mfg. Co.

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Spinks, H. C., Clay Co.
United Clay Mining Co.

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The Hommel, O., Co., Inc
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Maxson, Elwyn L.
Spinks, H. C., Clay Co.
United Clay Mining Co.

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Great Lakes Foundry Sand Co.
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Maxson, Elwyn L.
Potters Supply Co.
Spinks, H. C., Clay Co.
United Clay Mining Co.

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Hammill & Gillespie, Inc.
United Clay Mining Co.

**Clay (Wad)**
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Potters Supply Co.
Spinks, H. C., Clay Co.
United Clay Mining Co.

**Clay (Wall Tile)**
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Kentucky Clay Mining Co.
Maxson, Elwyn L.
Spinks, H. C., Clay Co.
United Clay Mining Co.

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Chicago Vitreous Enamel Product Co.
Pemco Corp.
Pennsylvania Salt Mfg. Co.

**Cleaners, Chemical**
Harshaw Chemical Co.
Pennsylvania Salt Mfg. Co.

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Leeds & Northrup Co.

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Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
Pemco Corp.
The Vitro Mfg. Co.

**Cobalt Sulphate**
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

**Colors**
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
Porcelain Enamel and Mfg. Co.
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Harshaw Chemical Co.
The Hommel, O. Co., Inc.

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Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Eureka Flint & Spar Co.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Maxson, Elwyn L.

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Lancaster Iron Works, Inc.

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Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Pennsylvania Salt Mfg. Co.
The Vitro Mfg. Co.

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Norton Co.

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Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

**Disintegrators**
Lancaster Iron Works, Inc.

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Hays Corp.

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Lancaster Iron Works, Inc.

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**Drying Machinery**
Frazier-Simplex, Inc.
Lancaster Iron Works, Inc.

**Electrocast Refractories**
Corhart Refractories Co.

**Enamelers' Borax**
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
Pemco Corp.

**Enameling Equipment (Complete)**
Chicago Vitreous Enamel Product Co.
Frazier-Simplex, Inc.
The Hommel, O., Co., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
The Vitro Mfg. Co.

**Enameling Furnaces**
Carborundum Co.
The Hommel, O., Co., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
Lancaster Iron Works, Inc.
Norton Co.

**Enameling Iron (Sheet)**
American Rolling Mill Co.

**Enameling Muffles**
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Ingram-Richardson Mfg. Co. of Indiana, Inc.
Frazier-Simplex, Inc.
Norton Co. (*Alundum*)

**Enameling (Practical Service)**
Chicago Vitreous Enamel Product Co.
Ceramic Color & Chemical Mfg. Co.
The Hommel, O., Co., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
Metal & Thermit Corp.
Pemco Corp.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

**Enamels**
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
Pemco Corp.
The Vitro Mfg. Co.

**Enamel Oxide**
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.

**Enamels (Porcelain)**
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Ingram-Richardson Mfg. Co. of Indiana, Inc.
Pemco Corp.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

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Harrop Ceramic Service Co.

**Equipment (Porcelain Enameling)**
Chicago Vitreous Enamel Product Co.
The Hommel, O., Co., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.

**Feldspar**
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Chicago Vitreous Enamel Product Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Eureka Flint & Spar Co.
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Maxson, Elwyn L.
Pemco Corp.
Pennsylvania Pulverizing Co.
The Vitro Mfg. Co.

**Filter Fabrics**
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Corhart Refractories Co.
Electro Refractories & Alloys Corp.
Green, A. P., Fire Brick Co.
Norton Co.
Taylor, Charles, Sons Co.

**Fire Brick—Process Equipment**
Lancaster Iron Works, Inc.

**Fire Clay**
Great Lakes Foundry Sand Co.
Spinks, H. C., Clay Co.
Taylor, Charles, Sons Co.

**Flint**
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Great Lakes Foundry Sand Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Maxson, Elwyn L.
Pemco Corp.
Pennsylvania Pulverizing Co.

**Flint Pebbles**
Ceramic Color & Chemical Mfg. Co.
Eureka Flint & Spar Co.
The Hommel, O., Co., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
The Vitro Mfg. Co.

**Floors (Non-Slip)**
Norton Co.

**Fluorspar**
Ceramic Color & Chemical Mfg. Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

**French Flint**
Eureka Flint & Spar Co.
Maxson, Elwyn L.

**Frit**
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Chicago Vitreous Enamel Product Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
Pemco Corp.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

**Frosting Mixtures**
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

**Fuel Oil Systems and Control Stokers**
Frazier-Simplex, Inc.
Harrop Ceramic Service Co.

**Furnaces**
Carborundum Co. (*Carboradient*)
Frazier-Simplex, Inc.
Harrop Ceramic Service Co.
The Hommel, O., Co., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
Swindell-Dressler Corp.

**Furnaces, Enameling**
Swindell-Dressler Corp.

**Gauges, Draft (Recording, Indicating)**
Hays Corp.
Leeds & Northrup Co.

**Gauges, Flow (Air and Gas)**
Hays Corp.

**Gauges, Pressure**
Hays Corp.
Leeds & Northrup Co.

**Gauges, Ratio (Flows)**
Hays Corp.

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Frazier-Simplex, Inc.

**Glass Equipment**
Lancaster Iron Works, Inc.

**Glass Melting Tanks and Furnaces**
Frazier-Simplex, Inc.

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Ingram-Richardson Mfg. Co. of Indiana, Inc.
Pemco Corp.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

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Eureka Flint & Spar Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Maxson, Elwyn L.

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Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

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Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
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Harshaw Chemical Co.
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Pemco Corp.
The Vitro Mfg. Co.

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Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Maxson, Elwyn L.
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The Vitro Mfg. Co.

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The Hommel, O., Co., Inc.
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Ingram-Richardson Mfg. Co. of Indiana, Inc.
Norton Co.
Taylor, Charles, Sons Co.
The Vitro Mfg. Co.

**Lithium Carbonate**
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Drakenfeld, B. F., & Co.
Foote Mineral Co.

**Lithium Minerals**
Foote Mineral Co.

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Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
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The Hommel, O., Co., Inc.
Pemco Corp.

**Magnesite**
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Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Foote Mineral Co.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

**Magnesite Calcined**
Ceramic Color & Chemical Mfg. Co.
Foote Mineral Co.
The Hommel, O., Co., Inc.

**Magnesium Carbonate**
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Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

**Manganese**
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

**Manganese Dioxide**
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Drakenfeld, B. F., & Co.
Foote Mineral Co.

**Manganese (Oxide)**
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Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
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Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
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Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
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Pemco Corp.
Pennsylvania Salt Mfg. Co.
Titanium Alloy & Mfg. Co.
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Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
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The Hommel, O., Co., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
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Pemco Corp.
Titanium Alloy & Mfg. Co.
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Pennsylvania Pulverizing Co.
United Clay Mining Co.

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Ferro Enamel Corp.
The Hommel, O., Co., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
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Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

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Ingram-Richardson Mfg. Co. of Indiana, Inc.
Pemco Corp.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

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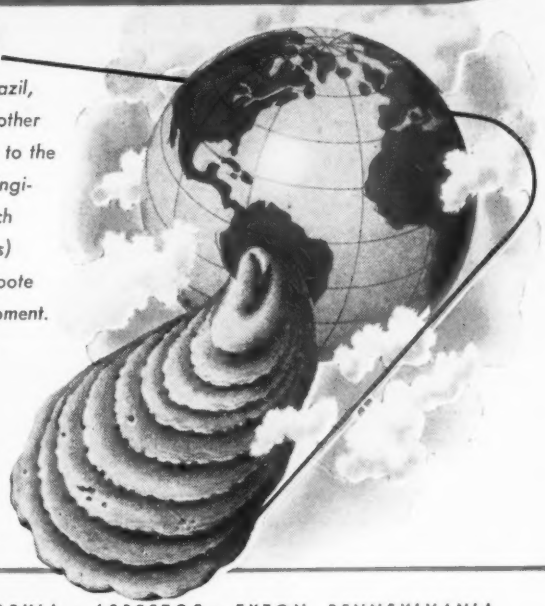

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Spencer Lens Co.
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Corhart Refractories Co.
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Norton Co.
Taylor, Charles, Sons Co.
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Orefraction, Inc.
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Pennsylvania Salt Mfg. Co.
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The Hommel, O., Co., Inc.
The Vitro Mfg. Co.
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Norton Co.
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Electro Refractories & Alloys Corp.
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Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Metal & Thermit Corp.
The Vitro Mfg. Co.
**Sodium Fluoride**
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Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.
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Harshaw Chemical Co.
**Sodium Nitrite**
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
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Harshaw Chemical Co.
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Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
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**Spar**
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Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Eureka Flint & Spar Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Maxson, Elwyn L.
The Vitro Mfg. Co.
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Chicago Vitreous Enamel Product Co.
The Hommel, O., Co., Inc.
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The Hommel, O., Co., Inc.
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**Steel Plate Construction**
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Industrial Ceramic Products, Inc.
Potters Supply Co.
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Stauffer Chemical Co.
**Sulfuric Acid**
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Pennsylvania Salt Mfg. Co.
Stauffer Chemical Co.
**Talc**
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Harshaw Chemical Co.
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**Tank Blocks**
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**Tanks (Pickle)**
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**Tile (Floor)**
Norton Co.
**Tile (Muffle)**
Carborundum Co.
Electro Refractories & Alloys Corp.
Norton Co.
**Tile (Refractory)**
Carborundum Co., (*Carbofrax*)
Electro Refractories & Alloys Corp.
Green, A. P., Fire Brick Co.
Norton Co.
Taylor, Charles, Sons Co.
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**Tin Oxide**
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Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
The Hommel, O., Co., Inc.
Metal & Thermit Corp.
The Vitro Mfg. Co.
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Drakenfeld, B. F., & Co.
Foote Mineral Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.
**Titanium Oxide**
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Foote Mineral Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Metal & Thermit Corp.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.
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**Trailers (Wood and Steel Deck)**
Clark Tructractor
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Harshaw Chemical Co.
**Trucks**
Lancaster Iron Works, Inc.
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McDanel Refractory Porcelain Co.
Norton Co.
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Electro Refractories & Alloys Corp.
Leeds & Northrup Co.
McDanel Refractory Porcelain Co.
Montgomery Porcelain Products Co.
Norton Co.
Taylor, Charles, Sons Co.
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Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
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Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.
**Water Softening Plants**
Frazier-Simplex, Inc.
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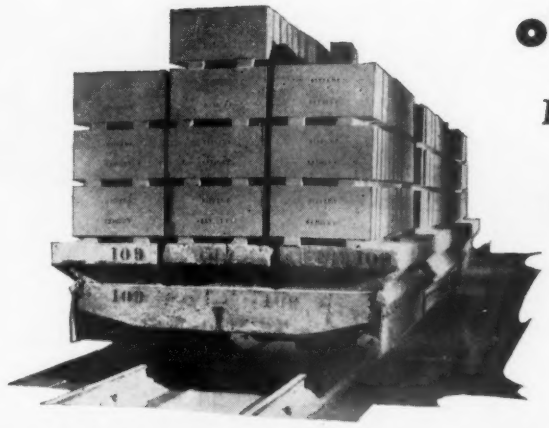
The Hommel, O., Co., Inc.
Ingram-Richardson Mfg. Co. of Indiana, Inc.
Pemco Corp.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.
**Whiting**
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc. Electrochemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.
**Winding Drums**
Lancaster Iron Works, Inc.
**Zinc Oxide**
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.
**Zircon**
Ceramic Color & Chemical Mfg. Co.
Foote Mineral Co.
The Hommel, O., Co., Inc.
**Zirconia**
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Foote Mineral Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Metal & Thermit Corp.
Orefraction, Inc.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.
**Zirconium Oxide**
Ceramic Color & Chemical Mfg. Co.
Foote Mineral Co.
The Hommel, O., Co., Inc.
Titanium Alloy Mfg. Co.
**Zirconium Silicate and Ultrox**
Metal & Thermit Corp.
**Zirkite (Natural $ZrO_2$)**
Foote Mineral Co.

# *To Speed the Day*

## of Victory and Peace

*Refractories are making possible the production of*

**TANKS · BOMBS · SHIPS**



**TO PRODUCE the vital implements of war, the industries of the United Nations must have fire brick and other refractory materials. Without fire brick to line the boilers and furnaces of industrial plants, heat could not be controlled for useful production. By means of refractories, crude ores are turned into the steel, copper, aluminum and magnesium that mean ships, tanks, airplanes, guns and ammunition. Gasoline and oil for our fighting forces are refined and made useful by the aid of fire brick. And the ships that must carry men and supplies to all parts of the world depend primarily upon refractories to make possible the creation of energy.**

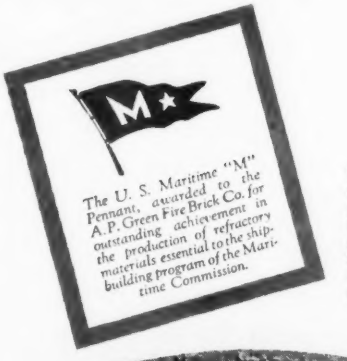
Today, A. P. Green is producing the refractory materials that are as essential to the war effort as they are indispensable to industry in times of peace.

While our United Nations' war effort needs vast quantities of our materials and is getting them—the A. P. Green Fire Brick Company has increased production to such proportions that it is able to meet the needs of our many export customers. Only restrictions on ocean cargo space limit our shipments to you. But you can be sure of this—whenever and wherever shipping space is available, A. P. Green products will be delivered to you without delay.

**PT BOATS:** Marine engines for these raiders which help keep sea lanes open to American shipping are made of alloy steel from furnaces lined with fire brick.

**BOMBS:** In furnaces lined with A. P. Green refractories, metals are refined and processed for making these weapons of aerial warfare.

**TANKS:** Conversion of crude iron into armor plate for tanks is accomplished in furnaces lined with A. P. Green fire brick and other refractory materials.


M
The U. S. Maritime "M" Pennant, awarded to the A. P. Green Fire Brick Co. for outstanding achievement in the production of refractory materials essential to the shipbuilding program of the Maritime Commission.

### Increased Production Provides for Regular Customers

While Uncle Sam needs our materials and is getting them . . . the A. P. Green Fire Brick Company planned ahead — with plant expansion and the development of advanced methods of increasing production, to such proportions that greatly increased shipments have been made during the past year — actually 59% more than the previous high pre-war year — truly an outstanding job of supplying both the needs of our war effort and the requirements of our many regular customers.

**A. P. GREEN**
**FIRE BRICK COMPANY**
**MEXICO, MISSOURI**

*the First Name in Refractories*

*Fireclay Brick . . Super Duty Brick . . High Alumina Brick . . Special Refractory Tile*
*Insulating Fire Brick . . Plastic Fire Brick . . Mortars . . Maintenance Coating Materials*
*Refractory Castables . . Oil Burner Combustion Chambers*

**A. P. GREEN FIRE BRICK CO.**
**MEXICO, MISSOURI, U. S. A.**
STOCKS IN THE PRINCIPAL CITIES OF THE AMERICAS

If you have used (CESCO) Refractories, you know them to be unexcelled in quality and performance. If you haven't, we urge you to try them . . . and find out for yourself just how good *good refractories* can be.

All (CESCO) products are made of the finest materials and under close *laboratory control* at each stage of production. Moreover, they are *pretested* at the factory for the specific service required—for mechanical toughness and structural strength; for resistance to unequal temperatures, high thermal shock, high oxidizing atmospheres, slagging and spalling.

Here at the Ceramic Supply Company we design and make a wide variety of saggers, hillers and other refractory specialties. And in our two modern plants we have ample capacity to meet your requirements promptly and fully.

Write today for full particulars!

**CERAMIC SUPPLY CO.**

**CROOKSVILLE, OHIO**

A Subsidiary of Ferro Enamel Corp.

# "Ceramic" Colors

## for

*Satisfaction in production*
*Complete range of shades*
*Prompt delivery*
*Favorable price*
*Availability*

FOR ENAMELS:—Colors and Oxides; Smelter Color Compounds; Graining, Printing, Stamping, Banding, Screening, Overglaze and Decalcomania Colors.

FOR POTTERY:—Glaze and Body Stains; Underglaze and Overglaze Colors for Banding, Spraying, and Screening; Art Glazes, Fritted Glazes and Fluxes.

FOR GLASS:—Vitrifiable Colors for Banding, Spraying, and Screening; Alkali Resisting Colors; Weather Resisting Enamels; White Enamels; Satin Matt Finish Colors; High Fire Convexing Colors; Low Fire Colors; Printing Colors; Batch Colors; Crystal and Colored Ices; Fluxes.

DECORATING SUPPLIES:—Screening Oils, French Fat Oil, Oil of Copaiba, Balsam Copaiba, Balsam Fir; Brushes; Knives and Spatulas; Grinding Mills.

CHEMICALS

Ammonium Carbonate
Antimony Oxide
Antimony, Black Needle
Barium Carbonate
Barium Chloride
Barium Chromate
Bentonite
Bone Ash
Cadmium Carbonate
Cadmium Oxide
Cadmium Sulphide
Calcium Carbonate
Calcspar
Cerium Hydrate
Chromium Oxide
Clay, Enamelers'
Cobalt Compounds
Cobalt Oxide
Cobalt Sulphate
Copper Oxide
Cryolite
Epsom Salts
Iron Chromate
Iron Oxides
Iron Sulphide
Lead Chromate
Red Lead
White Lead
Litharge
Lithium Carbonate
Magnesium Carbonate
Manganese Dioxide
Nickel Oxide, Black
Nickel Sulphate
Opax
Potassium Bichromate
Potassium Nitrate
Powder Blue
Rutile, Powdered
Selenium
Sodium Aluminate
Sodium Antimonate
Sodium Bichromate
Sodium Silicate
Sodium Silico Fluoride
Titanium Dioxide
Whiting
Zinc Oxide
Zirconium Oxide
Zircon, Milled
Zircopax
Zirconium Silicate
Calcium Zirconium Silicate
Lead Zirconium Silicate
Magnesium Zirconium Silicate

Meet our Mr. W. F. Wenning
and Mr. F. H. Kohne at the
A. C. S. Meeting

# "CERAMIC" COLORS

CERAMIC COLOR & CHEMICAL MFG. CO. . . . NEW BRIGHTON, PA.

## For faster, more efficient production . . .

# DU PONT SQUEEGEE OIL

**This outstanding Squeegee Oil costs less in most cases than ordinary oils of the same type, yet it—**

**★ Mixes easily with color—wets color quickly, uniformly**

**★ Has good dispersing qualities to assist in breaking up color aggregates during mixing**

**★ Makes a paste with the right viscosity for working through a screen without too high an oil ratio**

**★ Evaporates at correct rate—dries quickly, yet doesn't clog the screen**

**★ Has good leveling properties which eliminate screen marks and other small surface irregularities after printing**

**★ Dries to a hard film which withstands ordinary rubbing without damaging unfired film**

**★ Fires away leaving little or no carbon, with no tendency to blister or darken colors**

**★ Can be adapted far superimposing even with sensitive blues and reds**

Let us help you in applying Du Pont Squeegee Oil to your specific process requirements. For complete details, write, wire or telephone our nearest district office or: E. I. du Pont de Nemours & Co. (Inc.), Electrochemicals Department, Wilmington, Delaware.

DU PONT
REG. U. S. PAT. OFF.

## DU PONT COLORS and DECORATIONS
## *for CERAMICS and GLASS*

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

# THE NATION'S CALL FOR TIN AND ANTIMONY

# MUST BE ANSWERED

## USE ZIRCON FRITS*AND TAM ZIRCONIUM OPACIFIERS

All industry is feeling the emergency demand for Tin and Antimony which is needed for the armament program. Your use of Zircon Frits and TAM Zirconium Opacifiers helps to answer the nation's call for Tin and Antimony. In addition, you will find that Zircon Frits and TAM Zirconium Opacifiers improve the quality of your products. Ask for the services of a TAM Ceramic Engineer, who, without obligation, will give you practical assistance with your frit and opacifier problems. Write:

# TITANIUM
**ALLOY MANUFACTURING COMPANY**

TAM ZIRCONIUM TITANIUM PRODUCTS
Registered U. S. Pat. Off.

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**Representatives for Europe . . . UNION OXIDE & CHEMICAL CO., Ltd., Plantation House, Fenchurch St., London, E. C., Eng.**

* *"The Porcelain Enamel & Mfg. Co., Baltimore, Maryland; Chicago Vitreous Enamel Product Co., Cicero, Illinois; Ingram-Richardson Mfg. Co. of Indiana, Inc., Frankfort, Indiana, and American Porcelain Enamel Co., Muskegon, Michigan are licensed under U. S. Patents No. 1,848,567 and 1,944,938 held by the Titanium Alloy Manufacturing Company, and other patents pending, for the manufacture of zircon type enamel frits."*

# *THERE ARE STILL*

# *UNDISCOVERED CONTINENTS*

COLUMBUS had a definite goal—a westbound sea route to Asia. But what he found was a new continent—a new source of Nature's wealth.

Modern research also has its goals: it, too, discovers new resources. Starting from the knowns of science, it charts its voyages into the unknown. Behind each voyage is a theory that there is a passageway.

But research doesn't hold stubbornly to its theories. If it finds islands instead of a continent, it accepts them, for it expects the unexpected. It studies their relation to the known lands of science. And on the basis of its increased knowledge, it makes revised plans for progress. In science there is always a continent ahead.

Just what research will disclose can never be forecast. But history has proved that from research flow discoveries of value to mankind. From Bell Telephone Laboratories there has poured a full stream of improvements in the telephone art.

Bell Laboratories has kept America leading the world in telephony. And its researches have contributed importantly to other arts of communication—to the phonograph and sound-motion pictures, to radio broadcasting and television.

Today, as ever since Pearl Harbor, its efforts in research and design are devoted to the war needs of the nation.

When peace comes, its organized teams of research scientists and engineers will continue to explore and invent and perfect for the improvement of telephony.

BELL TELEPHONE SYSTEM

# SPINKS

**High Grade—Uniform Quality Clays**

*Types to Suit Your Individual Needs*

**Ball**

**Sagger**

**Wad**

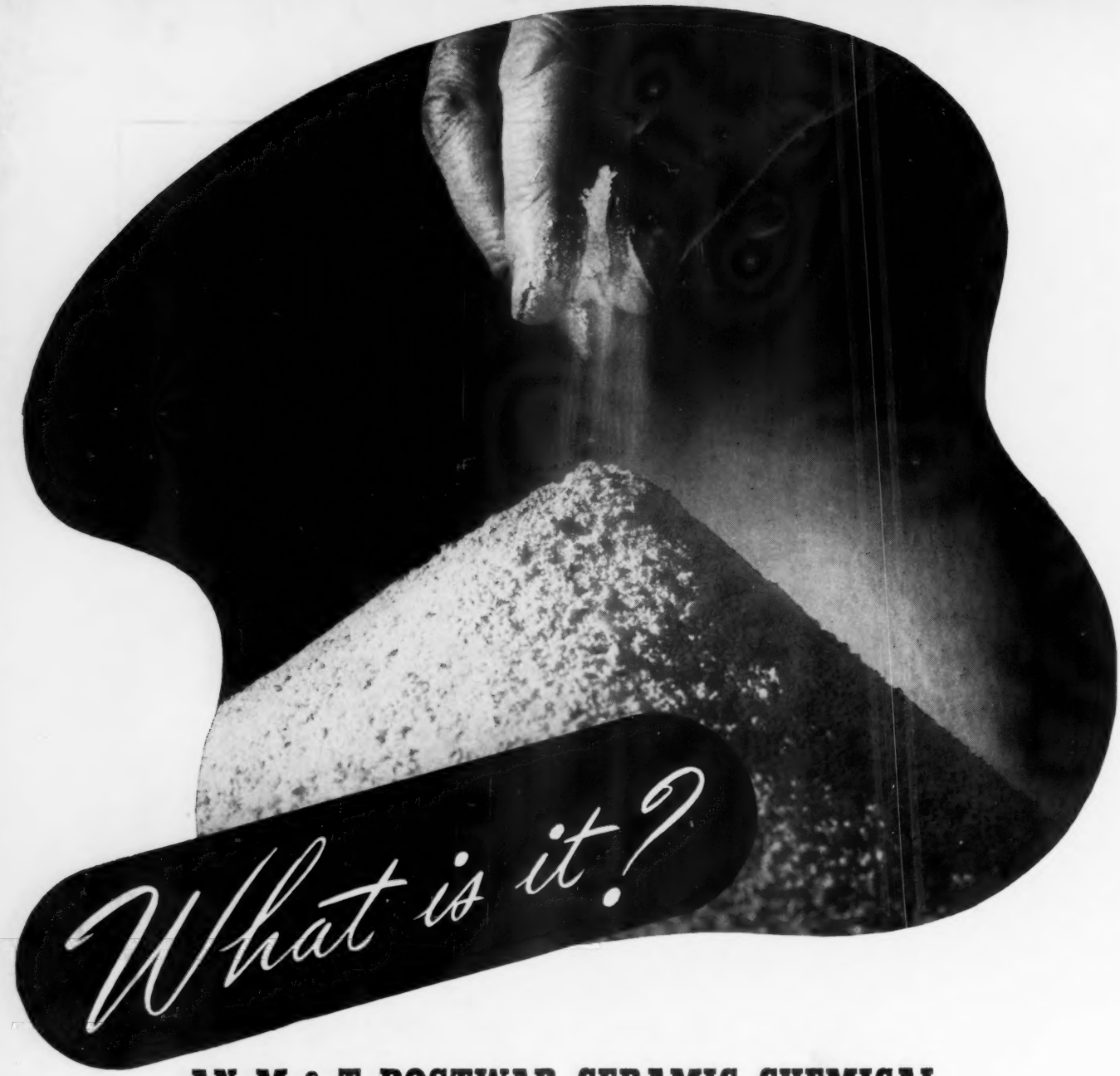
# CLAYS

The Spinks organization offers you the highest grade clays—all mined and stored under the strictest supervision and with the most modern equipment. Ample storage facilities assure you prompt shipment and low moisture content.

*Write Us for Samples*

## H. C. SPINKS CLAY CO.

**P. O. BOX 256 - - NEWPORT, KY.**




## AN M & T POSTWAR CERAMIC CHEMICAL

Here you see the picture of a postwar M & T ceramic chemical. It hasn't even been named yet, but as a development of wartime research at the M & T Ceramic Laboratory, it will contribute to better and more economically manufactured products when we are able to resume production of ceramic chemicals.

As usual, the facilities of our laboratory will be available to customers in getting the most effective results from our products.

**METAL & THERMIT CORPORATION**
**120 Broadway, New York 5, N. Y.**

**CERAMIC DIVISION**